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THE
LARYNGOSCOPE.

VOL. LIV MARCH, 1944. No. 3

DIAGNOSIS AND TREATMENT OF SINUSITIS IN CHILDREN.*†

DR. D. E. STAUNTON WISHART, Toronto.

A widely accepted point of view regarding surgical procedures on the nose was expressed by Charles T. Porter, of Boston, in these words: "The average practitioner seems to be distrustful of our specialty (rhinology) in particular. He is loath to refer the patient with sinusitis until some serious complication has arisen. As a result of this, if a case becomes a protracted one or terminates fatally, the specialist is obliged to take the responsibility. It is not surprising then that the public has become skeptical of the ability of the rhinologist to operate and get a good result." Strongly as this is expressed, it is probably an understatement of the actual point of view regarding similar work in children.

This paper is an attempt to discuss certain problems common to pediatricians and rhinologists in the hope that it will result in satisfaction to both in their treatment of these little patients.

Although the opinions expressed in this paper are personal, no opinions are voiced which are at variance with those of the heads of the various services at the Hospital for Sick Children, Toronto. This hospital serves almost 100 per cent

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of the children in a city of 850,000 population and 31 per cent of its admissions come from the Province of Ontario, which has approximately a population of 3,500,000. In the past 20 years there have been 28 cases of frontal sinusitis requiring a frontal sinus operation, 19 cases requiring extensive ethmoidectomy, and there have been only 11 cases which have been proven by autopsy to have died because of a meningitis following sinusitis.

This creditable record shows that the conduct of sinus treatment in our hospital has not brought in its train a grisly number of unfortunate complications. It is this record which justifies a statement of the principles and details governing our procedure in the diagnosis and treatment of sinusitis in children.

Sinusitis in children is not uncommon; it is frequent.

The prevalence of sinus disease in children has been shown by Ebbs — one of my colleagues at the Hospital for Sick Children, Toronto. At the Children's Hospital, Birmingham, he studied 495 consecutive autopsies of children up to the age of 14. All died of a variety of medical and surgical conditions and in 152 (30.6 per cent) a purulent secretion was found in nasal sinuses other than the frontal sinus. The antrum was the sinus most frequently involved.

The problem of the child, with symptoms and signs connected with the nose, is first of all that of the pediatrician and naturally the tonsils and adenoids receive his immediate attention. When in spite of this the symptoms and signs persist or complications of obvious nasal origin arise, he refers the patient to a rhinologist for examination. Here is the first step where judgment is required — for just as there are many good physicians who are not qualified to handle medical problems in children, so there are many eminent rhinologists who have neither the temperament nor the skill necessary to handle nasal conditions in children. The pediatrician can be trusted, sooner or later, to choose his rhinologist with care.

The pediatrician is entitled to receive a written report of the rhinologist's examination and opinion. In this report the patient should be assigned to one of three clases: *1.* the class in which the nasal signs and symptoms should disappear

spontaneously providing the rhinologist's advice is followed; *2.* the class in which office treatment by the rhinologist is required in addition to measures at home and by the physician; *3.* finally, the class in which it is hopeless to expect improvement unless more or less extensive operative work be performed.

Although certain recommendations have been made by the rhinologist, it is the physician who has the greater responsibility; therefore, the physician must consider carefully; — whether, if the whole procedure be well done, it is rational to think that it will produce the end-result suggested, and whether the surgeon can manage the child well enough to carry out the postoperative treatment to a successful conclusion.

Where can the pediatrician get the answers to his first problem? He will, of course, draw on his own experience of what has happened to his own patients; — but to a larger extent he will rely upon the textbooks of Anatomy, Physiology and Diseases of the Nose and Throat, and the current literature. The rhinologist in making his report will rely on the same two sources and on a third one — what he was taught in his postgraduate training. It is a fair generalization to state that operative work on the sinuses is rightly restricted to the closing part of such training and further that such training is largely restricted to observations on adults; in consequence the rhinologist commences practice with very little knowledge of the effects of such work on children. Actually, pediatrician and rhinologist are alike in that each depends on textbooks and literature for the answer to many questions.

Have you ever noticed the extraordinary paucity of information regarding the nose to be found in our textbooks of Anatomy, Physiology and Diseases of the Nose? Ask yourselves a few questions. What governs the engorgement and the contraction of the tissues of the nose? What parts of the nose can be cut or cauterized or removed without damaging this engorgement and contraction? Is there cavernous tissue or is there erectile tissue, or are there both in the inferior turbinate? Is the inferior turbinated bone just a shell of bone or has it a more complicated structure? What parts of the inferior turbinate can be removed without damaging a

patient's nose? How is the activity of a sinus controlled? By what route or routes does a sinus get the major part of its blood and lymph exchange? What are the immediate and what are the remote effects of therapeutic and surgical procedures on the ostium of a sinus?

The list of questions that might be asked is long. It is almost impossible to get an answer to any of these questions anywhere. Occasionally an answer is given on grounds that the rhinologist considers academic and only too often he finds

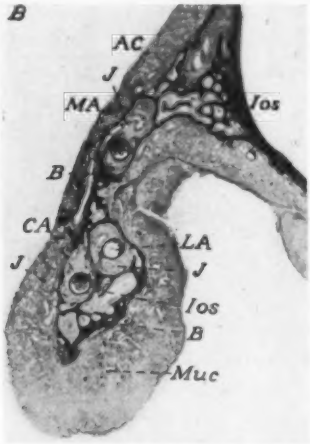


Fig. 1. A section taken 4 mm. anterior to the posterior end.

this academic judgment quite contrary to his own clinical experience.

These questions are not answered here, but the answers to a few of them can be deduced by the reader if he carefully considers three anatomical features now to be described.

ANATOMY.

a. The Inferior Turbinate: The vascular mechanism of the inferior turbinate is poorly understood. I have not found a description of it in English or American textbooks which is adequate and accurate. The descriptions do not even agree. The reader gains two conceptions which are erroneous:

First, the impression that the bony structure of the turbinal is framework only — whereas it is a structure of very special design; second, the impression that the mucoperiosteum contains blood vessels which anastamose freely and are of uniform size — whereas they are not of uniform size and their anastomosis is of peculiar architecture.

An inferior turbinate is an individual bone of the skull. It is an oblong torpedo-like structure, bent so as to be convex medianward and open on its outer side and it hangs downward from its upper attached margin. A prepared specimen

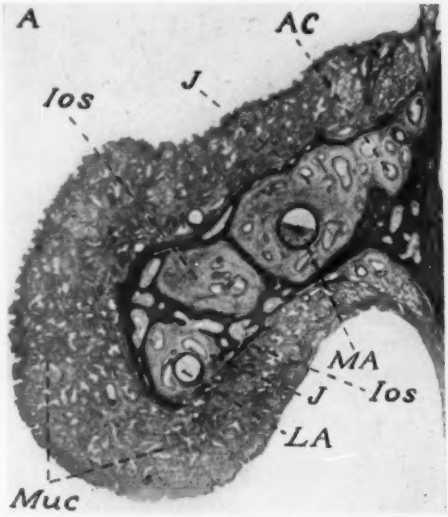


Fig. 2. A section through the central fifth of the turbinate.

of an inferior turbinated bone is so thin that it readily transmits light and it has so little weight that it seems as if it would be crushed in the fingers that hold it. Its surfaces are pebbled and wrinkled and in various places perforated by numerous apertures or traversed by longitudinal grooves or partial canals. A well prepared specimen seems to have no body nor any portion containing any system of canals.

Three pictures, selected from serial sections of an inferior turbinate made by Dr. H. H. Burnham, of Toronto (see Figs. 1, 2 and 3), show plainly that both the above description and

an excellently prepared anatomical specimen are inadequate because they fail to show that an inferior turbinated bone has a thicker portion in which lie canals of particular design. It is possible that the bony walls surrounding the blood vessels become destroyed in the preparation of the anatomical specimen by maceration.

The direct arterial supply of the lateral nasal wall is from the sphenopalatine artery and its branches. The sphenopalatine artery is a terminal branch of the internal maxillary artery and passes into the nasal cavity through the spheno-

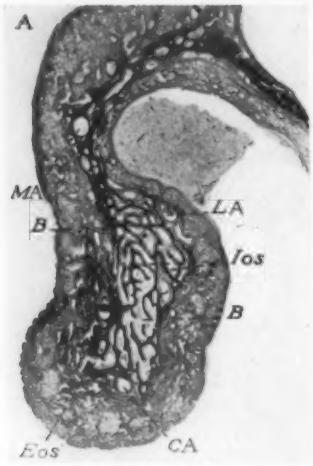


Fig. 3. A section through the anterior half.

palatine foramen. On entering the nasal cavity it breaks up into three branches: *a*. the inferior turbinate artery; *b*. the middle turbinate artery; and *c*. the nasopalatine artery. The inferior turbinate artery runs downward in the mucoperiosteum and then enters a large channel in the bone of the turbinate and at once divides into three large "intraosseous branches," two of which are indicated in Fig. 4. These terminal branches run through bony canals as far as the central fifth of the turbinate before they emerge to lie in the periosteal layer of the mucoperiosteum.

Fig. 4. is a modification of one of Burnham's pictures and shows a vertical slice through the bone of the middle portion of the inferior turbinate. It shows two very large canals in the bone terminating at the central fifth of the turbinate. It also shows the portion of the turbinate anterior to this dotted with tiny openings. The dotted appearance is due to numerous perforations in the bone through which tiny venules pass, carrying blood from the cavernous tissue to the large veins in the bony canals of the turbinate.

The cross-section of the turbinal shown in Fig. 2 proves that the bony part is not of paper-thinness but is a double-

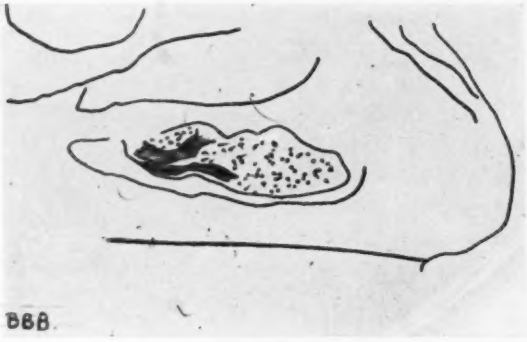


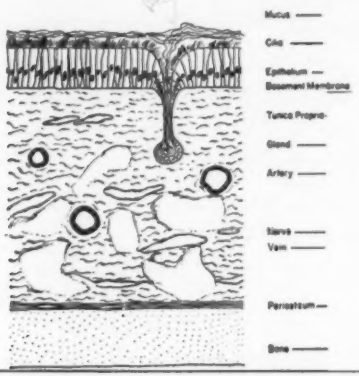
Fig. 4.

walled structure containing certain large canals which have a large artery, somewhere towards the center. Surrounding this artery is a plexus of veins. Both veins and artery are accompanied by an intricate nerve supply and presumably by lymphatics. As the turbinal must be capable of rapid decongestion, the venous bed is huge; consequently the bony channels which house it are large.

Thus the *bony* structure of the inferior turbinate is of a very special design.

b. The Mucosa of the Inferior Turbinate: Now, let us turn our attention to the mucosa.

Fig. 5 is a diagrammatic representation of a section through the mucosa of the inferior turbinate. Some of the large end-branches of the arteries of the bone canals run in the mucoperiosteum. From these and from the vessels in the bone, arterioles are given off which find their way to the surface layer of the turbinal mucosa. These surface capillaries connect with the cortical veins in the next layer below and these again empty into the large blood-lakes which fill



Components of the mucosa of Inferior Turbinal (modified from Proetz) showing large blood-lakes

Fig. 5.

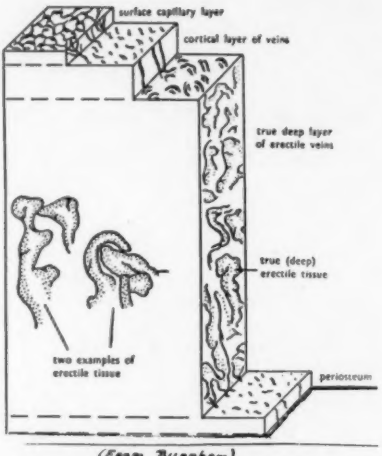
the greater part of the space between the basement membrane and the periosteum (see Fig. 6). From this layer of blood-lakes the blood leaves by veins which lie in plexuses in the large bony canals already pictured (see Fig. 2).

Thus the mucosa of the inferior turbinate contains blood vessels which are not of uniform size and the architecture of these is so peculiar as to arouse a suspicion of some functional importance.

c. The Sinus Ostium: A third anatomical feature to which I direct your attention is the histological anatomy of the mouth of a sinus. The openings of the frontal, maxillary sinuses are often the object of surgical or therapeutic pro-

cedures and, therefore, their structure is of practical importance.

The ostia open high in the nose — the majority additionally concealed by the middle turbinate — and hence are well protected from any inspiratory air currents. Air exchange in the sinuses is, therefore, not on the principle of the ato-



(From Burnham)

Diagram of venous layers of the inferior Turbinate. The irregular course and pouches of the erectile tissue veins are indicated.

Fig. 6.

mizer. That the ostia are always in a protected position suggests that they are worth protecting.

Nerves, arteries and veins enter each sinus from the lateral wall almost entirely via the mucoperiosteum of the ostium. According to Burnham the maxillary sinus obtains the smaller part of its blood supply via the natural ostium; the larger part travels through a membranous but non-bony window which lies between the lacrimal and ethmoidal processes of the inferior turbinate. On reaching the interior of a sinus the vessels form a collar-like plexus a few millimeters in width about the point of entry. They then pursue a straight course into the sinus lying in the periosteal layer

and radiating out from the plexus in straight lines like the rays of a setting sun.

Fig. 7 diagrammatically portrays the arrangement at the ostium of a sinus. The ostium of a sinus can be fittingly compared to a manhole in the street almost completely blocked by hose of various sizes passing to the caverns below.

This, then, is a *third* anatomical arrangement indicating a very special design and has been shown to demonstrate that in the management of sinusitis the ostium of a sinus and the region immediately surrounding it cannot be traumatized

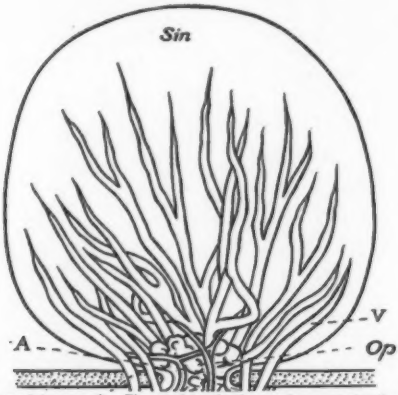


Diagram of sinus vessels. The arteries and veins are shown entering the sinus from the lateral nasal wall largely through the mucoperiosteum of the ostium but also through the bone about the ostium. The ostial plexus is indicated.

Fig. 7.

without serious damage to the physiological reactions of that sinus.

The structure and function of the arterial supply of the inferior turbinate is not fully known, and it is to be hoped that someone will interest himself in this field of investigation. Some mechanism may be at work in the vascular arrangements of the turbinate such as has been found recently in the venous sinuses of the spleen where Knisely has shown that there are by-pass connections and sphincters.

Diagnosis: The diagnosis of sinusitis in the child is made in the same way as in the adult.

While these few words cover the matter, still to dismiss it so briefly would be unsatisfactory to both pediatrician and rhinologist. The pediatrician desires to know what measures he can use, and the rhinologist desires to know what modifications of the technique used for the adult are advisable in the case of the child.

Infections of the upper respiratory tract constitute a large part of pediatric practice and when the rhinologist is consulted by the pediatrician the latter is looking for help — help that is practical and not merely academic, — and for results.

The first point of attack is the taking of the history.

History: Sinusitis can often be inferred from the history.

The clinical history as spontaneously given by a parent may be unreliable and misleading, for few people both observe accurately and describe such observations in good English. The taking of a good history takes time, patience and sometimes diplomacy. Certain frequently occurring symptoms and signs are now discussed in some detail, for often the finding of some of these is all that is necessary to make a diagnosis of sinusitis.

Symptoms and Signs: 1. Frequent Colds: In my experience a story of repeated head colds is the most frequent complaint regarding an otherwise healthy child in whom sinusitis is discovered. Time after time one will hear the same story — of "cold in the head one week, bed one week, school one week, bed one week, school one week. We don't think the cold really cleared in the intervals. We had his tonsils taken out but it made no difference. Last winter he missed a great deal of schooling and this year he seems to be starting the same performance."

The first question that must be asked the parent is, "What do you mean when you say that the child has a cold?" From sad experience the physician knows that the term "cold" may mean something different to each mother of five consecutive patients. The mother's description should be put down in her own words and, when that is done, specific questions should be asked and the replies carefully noted. Ask for details about onset; duration; severity; the presence or absence of fever; sore throat; swollen glands — which side; earache;

obstruction of the nose, one or both sides, transient, intermittent, constant, and what affects it; musty odor to the breath; discharge from the nose, quantity, consistency, color, variation, one or both sides; dropping in the throat; cough, kind, frequency, time of occurrence, with or without expectoration.

The physician should look for explanations for the head colds other than sinusitis — such as unsuitable clothing, faulty hygiene, exposure to infections at home, over-indulgence in candy, unwise chilling and exposure to cold and drafts, especially if the body has been overheated. Sometimes an adult member of the household is a carrier and the cause of the reinfections of the child.

Should the head colds show a definite periodicity, hunt should be made for the offending factor. It is unlikely to be the nose.

2. Nasal Obstruction — Stuffy Nose: The nose is a physiological organ and has many functions. It is the sprinkler and radiator system of the upper respiratory tract. A neglected but important function is the regulation of the amount of air and the direction of the air currents — this it does by rapid engorgement and disengorgement of the cavernous tissue situated chiefly in the inferior turbinate but also on the septum and the middle turbinate. Obstruction of the nose may be entirely a physiological response and only a carefully taken history will determine this; therefore, if the obstruction is intermittent, sometimes on one side and sometimes on the other, several safe conclusions can be made: *1.* that there is no permanent structural obstruction; *2.* that even if the septum has a deflection, the septal deflection is not the cause; *3.* that there is no hypertrophy of any turbinate; *4.* that there is no hyperplasia; and *5.* that the nose is capable of functioning properly.

If the obstruction is accompanied by the appearance of reddening at the nostril and the upper lip, suspect that the inferior turbinate is being annoyed by the intermittent discharge of an irritating secretion from the middle meatus — the product of one form of sinusitis.

If the obstruction comes on at the same time of day or always under fairly constant conditions, the physician should

be on the lookout for a constant irritant; but if the such recurring obstruction is accompanied by the other pathognomonic symptoms and signs, especially if it is bilateral — then allergy must be considered.

3. Nasal Discharge: If the nasal discharge is always from the same side the diagnosis will be between foreign body, sinusitis and nasal polyp.

4. Nasopharyngitis: As I have already said, infections of the upper respiratory tract constitute a great proportion of pediatric practice and often the original diagnosis is nasopharyngitis. This condition, although supposedly easily recognized by either physician or rhinologist, is not necessarily the original or even the main site of infection. Sometimes the nasopharyngitis is merely the accompaniment of an underlying disease of much greater importance. Sometimes the rhinologist forgets this. I know of an instance where a rhinologist visited a patient daily for nasopharyngitis and otitis media — and on the fourth day discovered that the patient had been rushed to the hospital because a pediatrician found the patient desperately ill with pneumonia.

On the other hand, nasopharyngitis is sometimes protracted because of irritating discharge from a maxillary sinusitis that simple transillumination could have disclosed.

Long-continued or recurring nasopharyngitis should lead to the suspicion of sinusitis. When suspected, differential diagnosis should be asked for. The penalty of neglect is that a sinusitis, capable of subsiding if adequately helped, may become subacute or chronic and thus be a cause in itself of a more serious local or distant lesion.

5. Protracted Fever: If, during a "cold," signs of infection in the throat disappear but the fever is unduly protracted, do not fail to look for sinusitis. If, in addition to the protracted fever, slight cervical adenitis or transient otitis media occurs — particularly if these occur on the same side — there should arise the suspicion that there is latent sinusitis.

6. Cough: In the absence of sufficient findings in the lungs to account for it, a cough should arouse suspicion of sinusitis.

Some types of cough frequently accompany sinusitis — other types do not.

A croupy cough indicates laryngeal irritation—and laryngitis—but it rarely occurs with sinusitis. In sinusitis the larynx often remains normal. Where there is severe bronchiectasis and a coincident purulent sinusitis, there is plenty of coughing, much expectoration of sputum and a reddened throat, but there is no true laryngitis.

When a cough has persisted a long time and is severe enough to suggest the presence of bronchiectasis, the cause will often be found to be a chronic sinusitis.

The cough of sinusitis, in my experience, is usually noticed as worse just after the child has gone to bed, for an hour or two in the middle of the night, or just after waking. Such a cough is often described as a "bark."

Two typical examples of the cough of acute or subacute sinusitis follow: The patients were school boys of good family and in each case tonsillectomy and adenoidectomy had been well performed years previously. The pediatrician had failed to find any cause for an exasperating and persisting cough.

D. G., aged 15, was examined for the cause of a cough, persisting for three weeks, and a musty breath accompanied by a dull feeling in the ears. His father reported the cough most severe at night after the boy had gone to bed, but denied other signs or symptoms. The boy, however, corrected his father, stating that during the second week he had had a cold characterized by fever, stuffiness of the nose, slight watery nasal discharge and a nasal obstruction sufficient to put him to bed for five days. He admitted having a slight headache at the height of the cold, but could not remember its location. He denied any deafness but complained of a slight feeling of stuffiness in the ears and of hearing a click in his left ear when he opened his jaw.

There was no finding except slight dullness of the left antrum by transillumination, definitely increased on bending forward. Desensitization of the left side of the nose permitted examination by nasopharyngoscope and shrinkage of the left middle meatus was followed by disappearance of the cough and the discomort in the ear.

J. F., a school boy, aged 10, had the same complaint and a similar history. He was examined five weeks after the onset. His story had been — cold in the head, school one week, bed one week, school one week, bed one week, school one week. One side of the nose and the ear of that side was consistently more bothersome than the other. Each bout was accompanied by marked deafness which cleared when the cold passed off. The only finding was a slight dullness of one antrum with transillumination increased on bending forward. L. H. L. treatment (see below) was instituted with apparent improvement, but in spite of this the boy had two more colds, each necessitating a week in bed. Under local anesthetic, the infected antrum was washed once. The solution evacuated a ragged, soft, light colored clot presumably mucopurulent,

the L. H. L. treatments continued at home for two weeks and there were no further attacks that winter.

7. Postnasal Drip: Excessive postnasal secretion is a symptom which is complained of only by older, more observant children. It is intermittent more often than constant. I consider it the cause of the cough of sinusitis already described.

8. Headache: Our medical service reports that the older children frequently complain of chronic headache. They are very indefinite about the complaint as a rule and fail to localize it. It is rarely complained of under the age of six and up to the age of 10 is so infrequent as to be worthy of attention when it does occur. Refractive errors are the usual cause. When an accompanying acute or chronic sinus is discovered it should receive immediate attention.

9. Pain: Pain is not a usual accompaniment of acute or chronic maxillary sinusitis in children. Intelligent, sensitive children of 14 can have an antrum filled with purulent discharge or with a large nasoantrochoanal polyp and refuse to admit pain even when pressure is applied.

10. Severe Impairment of the Sense of Smell is pathognomonic of ethmoiditis. It occurs when the ethmoids are so swollen that they press the middle turbinate tight against the septum and hold it there. Also when a large ethmoidal cell in a middle turbinate is so swollen that the same condition arises. The symptom usually occurs when the ethmoidal involvement is bilateral — but it can also occur in an unilateral involvement if the septum is pressed over against the middle turbinal of the uninvolved side.

11. Conjunctivitis: A watery or mucopurulent discharge from one eye with reddened conjunctiva (in the absence of other reason) should lead to a suspicion of involvement of the anterior ethmoid sinuses.

12. Facial Appearance: Of great importance is the general appearance of the child. Abnormal broadening of the bridge of the nose with a bulge in the nasal furrow just below the inner canthus of the eye practically always indicates a gross pathological condition of anterior ethmoid cells lying under the lacrimal bone.

Pallor and pudginess of the skin under the eyes and over

the nose and a tired look in the eyes often accompany excessive edema of the ethmoids.

13. Mental dullness or apathy or inability to get on at school is surprisingly frequently complained of in children in whom ethmoiditis can be discovered. It is an amazingly important symptom — and it is most gratifying how the symptom seems to vanish when ventilation of the top of the nose is re-established.

14. Great swelling and edema of the lids of one eye of a young child is now recognized as not of orbital origin but usually of ethmoidal origin. The inflammation often recedes spontaneously. Often, however, an abscess forms that points at the inner angle of the eye in the upper or lower eyelid. The pediatrician should never think when such an inflammation has subsided that the danger is over. It may recur. A track from the ethmoid to the orbit has been formed. The lesion in the ethmoid cells takes a very long time to return to normal. The patient always should be put under the care of a rhinologist and followed for months until to the best of his knowledge the ethmoid has returned to normal.

15. Attacks of nausea and vomiting without diarrhea have led to the discovery of copious postnasal secretions secondary to sinusitis.

Histopathology: The paranasal sinuses are air-containing cavities which communicate by narrow passages with the interior of the nose. The mucous membrane lining them is continuous with that of the nose, and differs but slightly from it in appearance, function and histological structure. When normal it is less than a millimeter thick. After the first few months of life, low grade changes are always present. The nasal and sinus respiratory mucous membrane is continually active as a barrier to foreign elements. The cilia are always in motion, propelling the sheet of mucus to which bacteria and foreign matter may adhere. It is thus constantly physiologically active; however, as it is always exposed to fresh attacks of air-borne bacteria, its normal state can be considered as that of light inflammatory reaction.

By paranasal sinusitis is meant pathological (inflammatory) change in the contents, or lining, or bony walls of one or more of these cavities.

In its early stages sinusitis is caused by the spread of infection from the nose and is a surface infection. Infection of a sinus results in inflammatory reaction in the mucosa, characterized by swelling and edema. An exudate of mucus occurs and soon is converted to mucopus by the invasion of pus-forming organisms. With adequate patency of the outlet of the sinus, this material escapes and the mucosa returns to normal. Spontaneous recovery of this type of sinusitis is the rule.

Continual blockage of the outlet from any cause, whether infection, allergy or very intense inflammatory reaction, produces more severe changes. Destruction of cilia, ulceration of the surface, and, finally, invasion of the subepithelial layers by bacteria may result. Such changes are apt to be most marked in the superficial or subepithelial layers, and this is fortunate, for these can be reached by therapeutic solutions. As a rule the pathological condition is acute or subacute and the tissues return to normal if the treatment is adequate.

Invasion of the underlying stroma may produce pathological changes, such as: simple inflammatory reaction, filling of the meshes of the stroma with serum, round-cell infiltration, eosinophile infiltration, abscess formation; and then while the surface returns to normal the underlying stroma may remain tremendously thickened; in which case, chronic, latent or nonpurulent sinusitis has been produced.

Swelling of the stroma may cause the lining to fill the cavity of the sinus, and in extreme cases the resulting pressure may be sufficient to cause destruction of parts of the bony walls.

When the infection has become grossly established in the submucosa, the only effectual method of dealing with it is by extensive removal of the lining of the sinus.

This can be achieved in the maxillary sinus; but when one or more of the other sinuses has become so affected it can be done with only indifferent and varying success.

No course of treatment is too arduous or too prolonged which will prevent the advent of this condition in sinuses other than the antrum.

After the removal of the unhealthy lining of a sinus, the interior becomes lined through a process of repair and bone

proliferation; the walls of the cavity become lined by a layer of granulation tissue of variable thickness which eventually organizes and becomes scar tissue, and over this spreads an epithelium, in many instances bearing cilia, and so the cavity may become healthy, and again assume some functional activity; but sometimes this epithelum may be of a character not suitable to the sinus, and under it any of the original pathological conditions may redevelop.

This is further evidence of how important it is that the beginnings of chronic sinusitis should be corrected as early as possible.

Etiology: The essential cause of sinusitis is the spread of bacterial infection from the nose; consequently it may occur in association with the exanthemata of children, influenza and pneumonia. Some sinusitis has followed mechanical irritation such as the introduction of water when diving. Some maxillary sinusitis has been caused by the penetration of the sinus by infected teeth and some is secondary to an infected wound or fracture — but these are rare.

Which sinuses are involved is determined largely by the configuration of the inside of the nose; cystic or polypoid turbinates, deflection or spurs of the nasal septum, a large ethmoidal bulla, are common peculiarities which help to produce nasal obstruction and hence, by stasis, sinusitis. Similarly, allergy can be a factor in the production of sinusitis.

The middle meatus is most important, for most of the sinuses enter into it; it is the passage through which infection must pass before it reaches these sinuses; hence, it is the meatus whose physiological functions must be kept healthy and active.

DIAGNOSIS.

Methods of Examination: Attention has been directed to the importance of the facial appearance and expression of the patient. The neck is examined for enlargement of the glands. Systemic causes of glandular enlargement must have been eliminated. Prominence of the deep cervical chain of glands, particularly those behind the sternomastoid, indicate

the presence of infection in the upper respiratory tract. The throat is examined for evidence of nasopharyngitis.

Examination of the nasal airways discloses the color of the mucous membranes, the patency of the airways and the presence, absence, character and location of discharge. Then the patient is transilluminated.

Unilateral purulent nasal discharge, or easily recognized nasal polypi (see later) or marked asymmetry in the transillumination may make the diagnosis of sinusitis easy. As a rule much more is necessary. It is essential to take plenty of time in examination.

The nose is gently sprayed with an isotonic solution of ephedrine in saline and the patient made to blow each side of the nose into a separate dish. After an interval the procedure is repeated. This permits determination of the quality and character of the nasal discharge from each side of the nose. Sometimes a discharge that was scanty and mucoid at first changes dramatically and long ropes of thick, tenacious mucoid or mucopurulent material is evacuated from one or other side — evidence that certain of the sinuses had been blocked. Sometimes almost pure and maybe foul pus comes at the end of such a performance.

After an interval the nose is desensitized for five minutes with long, thin strips of absorbent cotton wrung out in a mixture of equal parts of five per cent cocaine and a vasoconstrictor. The desensitization permits better examination of septum, turbinates and meatuses, and allows the passage of the nasopharyngoscope.

With the nasopharyngoscope can be seen, from front to back, the inferior and middle turbinates, the inferior and middle meatuses and the septum; also, the whole of the nasopharynx can be seen. The presence of a thin ribbon of cloudy secretion, the so-called "pus streak," establishes sinusitis with certainty. If none has been seen five to 10 minutes should be allowed to elapse and then the nasopharyngoscope again passed. It may be on this second use of the instrument or at examination some days later that the tell-tale "pus streak" will be found.

The transillumination is repeated. Sometimes an antrum that had been dark now will light, indicating that swelling of

the outer side of the inferior turbinate had been responsible for the impaired illumination.

Transillumination is a most valuable aid in the diagnosis of sinusitis but it is not infallible. The light should be used at its full and also at its medium intensity. The maxillary sinuses of children normally illuminate brilliantly. Impairment of illumination is a positive indication of trouble, but the reverse is not true, for the rhinologist has often found infected or purulent discharge in sinuses that have transilluminated well.

Roentgenograms should be made unless the diagnosis is obvious and on rare occasions a radiopaque solution can be injected into a maxillary sinus.

The history, findings, and radiographic evidence determine the diagnosis and advice.

Radiographic Examination: The radiograph is a valuable aid in the diagnosis of nasal sinus infection in children. It should be studied by the rhinologist in conjunction with the clinical findings. The film must be well taken and without evidence of movement. If, for reasons of economy, only one picture is to be made, the posteroanterior exposure is the most valuable and should be taken in such a position that the superior border of the petrous bone lies below the floor of the maxillary sinus in the film. Relative fogging of an antrum is usually evidence of the presence of maxillary sinusitis. The 23° posteroanterior position is of great value in determining the condition of the frontal sinuses, for an involved sinus will usually show a shadow and an outline that is blurred. For the determination of the condition of the ethmoidal and sphenoidal sinuses, exposures from side to side and from top to bottom are required and the resulting films studied in conjunction with the 23° posteroanterior film.

The value of an X-ray report on the sinuses of a child varies with the excellence of the film and the experience of the writer of the report. I have never seen a child's maxillary sinus that looked perfectly clear in the X-ray proven to be pathological; but a maxillary sinus that was described as of equal density with its fellow I have often proven to be pathological. Experience has taught many rhinologists that

a milky fogging of the maxillary sinuses in a child is always indicative of a pathological change.

Radiopaques: In making important decision it is sometimes advisable to get more definite visual evidence of the position and extent of the pathological area in a sinus. This is done by filling the cavity with radiopaque oil and taking X-ray films in two directions. There are two methods: The method of filling by puncture with trocar and cannula, and the method of displacement instillation.

The maxillary sinus lends itself readily to filling by puncture below the inferior turbinate and this method can be used even in very young children when necessity demands. It can be done without pain and without causing fear. The method has the advantage of giving a completely adequate picture of the condition of the antrum — a picture satisfactory to both consulting physician and parent. The two antra should not be injected at the same sitting, for, in the side to side view, the opaque masses in the antra are superimposed on one another and there will be lack of certainty as to which antrum is involved and which is not.

Displacement instillation *partially* fills *many* sinuses on one side at the same time. The picture produced is very difficult to interpret even for the expert: the picture is not clear-cut; it is inconclusive and, therefore, unsatisfactory. I have abandoned this method in the diagnosis of sinusitis in children, for I have found it not only unsatisfactory but also impracticable. For accurate interpretation of the signs of sinusitis by this method, three radiographs are essential — a preliminary radiograph, a radiograph of the sinuses after the displacement instillation of radiopaque solution and a radiograph taken 72 hours afterwards. The three sets of film are compared and studied. This lengthy procedure does not appeal to either the physician or the parent. Neither in my clinic nor in my office has it been possible to so co-ordinate my own services with those of the radiologist to make the procedure justifiable for children. The procedure can be carried out even on little children, but it takes extraordinary care on the part of everyone concerned—nurse, radiographer, rhinologist — to avoid arousing a fear complex in both the child and the parent. In consequence I have not found that it enhanced my reputation with patient, parent or physician;

and for the successful treatment of sinusitis in children, the rhinologist must have the successful co-operation of all three of these.

These objections could be waved aside as of no consequence if it could be shown that radiopaque evidence of sinusitis in children after displacement instillation was of definite diagnostic value, but both my pediatric and radiological friends have failed to find that it is. The absence of the radiopaque solution in a sinus is not an absolute proof that the sinus is infected — for there are many conditions that may prevent or interfere with the solution entering the sinus. Sinuses whose ostia are badly blocked, or which are not air-containing, do not fill with the radiopaque solution — for the filling depends entirely on the removal of air. A sinus may fail to fill because the negative pressure may have caused a congestion and hence a swelling of its lining mucosa. In consequence, the interpretation of films made by this method is always open to dispute.

Differential Diagnosis from Allergy: I have been impressed with the frequency with which writers of papers on allergy assume that the diagnosis of the allergic nose is easily made on the characteristic symptomatology and the appearance of the nasal mucous membrane. This assumption is fallacious.

The characteristic nasal symptoms are supposed to be: *1.* Attacks of sneezing; *2.* accompanying discharge from the nose; and *3.* nasal obstruction. All of these are physiological responses which can be elicited in a normal nose by a great variety of stimuli. Sneezing can be aroused by chemical fumes — by dust — by pollens — by infection and by foods — by various rays in the sunlight — by changes of temperature — by chilling or warming of various parts of the body. The characteristic color of the nasal mucosa in the allergic patient is supposed to be not red but pale gray. This gray color is sometimes due to excessive mucus which is lying on the front end of an inferior turbinate — an inferior turbinate whose mucosa may be found to be normal — and, therefore, neither inflamed nor allergic. Nasal obstruction can arise from engorgement of the cavernous tissue of the nose and be an entirely physiological response. Hence some of these patients whose nasal mucosa is apparently pale and edematous are

suffering not from nasal allergy but from nasal something else.

The medical profession is not going to understand this problem of allergy until the skilled use of the head mirror is insisted upon as an essential in adequate undergraduate education.

Is there, then, no response or appearance in the nose which the rhinologist can recognize as pathological and as indicative of the allergic state? There are two: The first of these is an inability to relieve the sensation of intense pressure and the appearance of intense blockage of the nose by the application of any strength or combination of the three drugs, cocaine, adrenalin and ephedrine. In the normal nose the application of suitable combinations of these drugs will shrink the mucosa intensely and keep it shrunk for the greater part of an hour. The nose of the *severe* allergic does not so respond. These characteristics in the less severely allergic nose can be alleviated for only a short time.

The second of these is the appearance of an excessive number of eosinophils in the sputum and the nasal secretions. Eosinophils in the nose have been found accompanying inhalant sensitivity, food sensitivity and also bacterial infections in asthmatics. Polypi often contain eosinophiles and sometimes may be filled with them.

I have had patients presumed allergic, in whom the symptoms and signs disappeared after the elimination of an infection in an antrum. The inference, therefore was that these patients were suffering from bacterial allergy. In this manner only can sinusitis be the cause of allergic rhinitis.

It is probable that in large numbers of allergic patients the nasal symptoms are either absent or very minor. For instance, I am sent many patients suffering from asthma — but very few suffering from eczema and none at all suffering from certain other types of allergic disease.

In spite of the fact that allergic diseases are manifestations of the reaction of body cells to irritants, many of which are not known, many allergic patients find their way to the rhinologist because they are so distressed by their nasal discomfort that some form of local relief is urgently desired.

Allergic patients suffering from sinusitis should have their sinusitis cured if possible because the patient's allergy may be

of the bacterial type and may clear up when the infection has been eliminated.

It is pointed out elsewhere that nasal obstruction leads to stasis of nasal secretions and so to infection of the latter. Nasal polypi obstruct and, therefore, should be removed. Some nasal polypi after removal are found full of eosinophils. Not all nasal polypi are eosinophilic: there are many other varieties and the type cannot be told except by histological section *after* removal.

Do not allow a child to suffer from severe nasal obstruction because you think its nasal polypi are allergic in origin. Do not forget that allergic conditions may lead to sinusitis.

Don't forget that elimination of an infection from an antrum sometimes has cleared a condition presumably allergic.

Treatment: The method of treatment of sinusitis adapted for a particular child will vary according to the age of the patient, the location and degree of the lesion and the co-operation of the patient. Consequently many methods have been evolved and require discussion.

In many texts consulted by the physician rather than the rhinologist, stress is laid on the importance of keeping the sinuses draining properly and more than one text sagely asserts that it is well to keep the ostia of the sinuses patent. Now, the truth is, first, that when a nose is discharging, the discharge may be coming entirely from parts of the main airway and not from the sinuses at all; second, that the ostia of the sinuses are hidden and cannot be seen from the front of the nose, and in children very rarely even with a naso-pharyngoscope. The physician cannot examine a nose, and many a rhinologist will not take the time to do so, so that the above advice is nonsense.

Certain Measures to Improve Physiological Function: Splashing the face with cold water, followed by vigorous but gentle drying, temporarily contracts the inferior turbinates; therefore, follow this procedure by having the patient bend forward and blow the nose clear and then having him sit up, close his lips tightly and breathe several times through the nose — but not too rapidly.

A patient with sinusitis is best kept in the erect position:

when resting have the head raised on several pillows and encourage lying on the side rather than on the back.

The air which reaches the bronchial tree should be moist and not dry. During such time as the patient's nasal obstruction is marked, he must breathe with the mouth open and thus breathe into his lungs the hot, dry air of the modern house. Combat these conditions with a steam kettle.

The Child That Cannot Blow Its Nose: An infant is too young to obey any command and does not know how to blow its nose. Instruct the mother that it is necessary that the child's nose should be kept clean. Tell her to lay the child face down on a flat surface. If the child cries, so much the better. The treatment is not to be done as a punishment. The combination of the face downward position, with crying, results presently in the child snorting discharge out of both sides of its nose. As soon as this has occurred, the mother should wipe the child's nose and sit it up. This treatment should be done very many times a day: every few minutes during convenient hours. Presently the child associates the appearance of discharge from the nose with being able to sit up and many babies quickly learn to blow their noses this way.

Instruct the mother on the importance of making the baby sneeze. Tell her to laugh with the baby when he sneezes and make him enjoy it. The sneeze is nature's way of getting rid of discharge from remote crannies of the nose. Sometimes the sneezing can be aroused by tickling the front of the nose.

The physician can sometimes use suction from a soft rubber syringe to get obstructing secretion out of an infant's nose. But I rarely instruct a mother to use this method. I find irrigation (to be described later) more satisfactory.

Nose drops should be given for a purpose — which may be lubrication, vasoconstriction, antisepsis.

Types of Nose Drops: Limitations of time and space prevent more than the rather sweeping statement that the majority of the nose drops widely prescribed a few years ago — and possibly still in widespread use — have been proven by experiment to be either useless or definitely harmful. The physician is recommended to read the pages on this subject

in Proetz' Applied Physiology of the Nose. This will convince him that normal saline or Locke's solution or Ringer's solution should be the vehicle of whatever ingredient he desires to use and that that ingredient should be of a character and strength which will not destroy the activity of the nasal cilia. Alkaline solutions should not be used, for they act as irritants to the nasal mucosa. Any solution used in the treatment of the nose should have a pH similar to that of normal nasal secretion which is slightly on the acid side.

The method of administration matters as much as the prescription. As usually given, they may not reach the part of the nose involved. It is not sufficient just to advise "so many drops in the nose so many times a day." The method can rarely be explained to the mother without demonstrating to her and her little child exactly how it is to be done, and without answering the questions of both parent and patient. It is frequently necessary to give specific directions about what is *not* to be done. Finally it is necessary to know that the directions are understood and will be carried out; otherwise, why prescribe the drops? A physician, therefore, should never prescribe nose drops over the telephone.

Position of Head: One of the textbook methods advised for the use of nose drops is the bend-back-bend-forward method. The patient opens the mouth, tilts the head back, injects a dropperful of the solution into his nose and then jerks the head forward and bends his neck so that his head is between his knees. This method throws the solution into the superior meatus of the nose, and some of it goes against the cribriform plate. This region of the nose never requires amateur treatment of this sort with any solution. This method of using nose drops is to be condemned and should never be prescribed. I have had many consultations in which the only step necessary to cure the patient's complaint was to stop using this particular treatment.

Textbooks and even advertisements often show a photograph recommending the extreme head-back position for the use of nose drops. In this position the drops again will fill the superior meatus and lie against the cribriform plate. One authoritative article on the treatment of sinusitis in the infant recommends that "the head should be tilted back so the solutions will enter the supreme meatus." On three occa-

sions a severely ill child has been admitted to hospital with a provisional diagnosis of meningitis following treatment with 3 per cent aqueous ephedrine in this position. All that was necessary to effect a cure in these patients was to stop this particular treatment.

Irrigation: Irrigation of the nose with warm isotonic solution is a pleasant, beneficial and safe form of treatment and can be used over long periods without any harm, providing always that it is prescribed at the proper times and carried out in the exact manner which is known to be safe.

There are times when a running of the nose is beneficial — for it is the natural way of washing away irritants; therefore, in the acute stage of rhinitis or sinusitis such discharge is best left alone. As the acute stage passes and the discharge becomes thicker and less in quantity, the physiological activity lessens and a condition that is pathological and perhaps painful threatens. At this stage the thickened mucus may obstruct the airways. Stasis of nasal mucus has to persist only for 24 hours to result in infection and then the mucus becomes mucopus. When the discharge is mucoid and still more when it is mucopurulent, warm isotonic saline as a spray or as an irrigation is indicated.

Why should we desire to irrigate a nose? Because mucin is freely soluble in salt solution and because irrigation with saline is a good way of getting rid of it. Why should we desire to get rid of mucin in a patient's nose? Long ago, Linton proved that the bactericidal action of nasal secretion is lost when the nasal mucus has remained quiet for 24 hours and once it is lost, the stagnant nasal discharge becomes a good medium for the growth of organisms. Nungester proved that if mucin be mixed with bacteria the virulence of the infection is increased to an appreciable degree. When bacteria are suspended in sterilized mucin and injected intraperitoneally, subcutaneously or in the lower air passages, they are so injurious to the animal host that it will frequently die from small sublethal doses. Mucin does not interfere with phagocytosis but does inhibit the bactericidal properties of phagocytic cells. It enables bacteria to survive in the body of the host for longer periods without diminution in number.

The way to prevent stasis of nasal secretions and hence the

way to prevent the complications due to secondary infection is to wash away the material as often and as long as required. This can be done by dropping a warmed isotonic saline solution into the nose or by spraying it in or by using it as an irrigation. Clinically these methods have been found of great value. Some academic wiseacres from experiments on animals have condemned the use of saline solutions in any of these ways. Proetz has answered this condemnation admirably (see Applied Physiology of the Nose, p. 324). Clinically we know that complications have arisen occasionally when one of these methods has been used; but in by far the greatest percentage of cases where we have used these methods there have been no complications and there has been recovery and no damage to the patient's nose. In spite of the apparent academic proof to the contrary, we know that these methods are useful, are comforting and can be used with benefit and can be used safely.

The secret of using irrigation safely is to give exact instructions as to how it is to be done — to demonstrate the procedure until the mother and the child understand and then to obtain a promise that the instructions will be carried out exactly as ordered. If it is perceived that the mother is incapable of carrying out the treatment exactly, then the treatment should not be ordered.

One of the greatest authorities in a text written for pediatricians strongly advises irrigation of the nose for the treatment of infants because infants cannot blow their noses and pus may fill the nasal passages. It seems evident from the literature that pediatricians have forgotten that Dean advised this procedure for infants. He was convinced it was both beneficial, prophylactic and safe.

Still another authority has advocated giving these treatments with the patient lying on the bed. This is instanced because it is wrong advice. That is the position in which complications can well arise: otitis media, spread of sinusitis, gross edema of the nasal mucosa.

The treatment must be given with the child lying face downward. The mouth must be kept open (a baby doesn't require to be told — it will cry and keep its mouth open). The patient must lie in that position for a few minutes after the

treatment. The patient must not hold the nose when blowing it at the end of the treatment but must snort out freely.

It is stated that "frequent irrigation of the nose and sinuses over long periods is to be avoided as it tends to produce a bogginess of the mucosa." This statement is a condemnation of a form of treatment which clinicians have long observed to be of much value. In my own practice is a mother who has a well-founded aversion to operations on the sinuses. Some of her numerous family have had severe sinus infections. She had treated the various attacks by irrigation when I have so advised. One of her family was started on this treatment as an infant and in the earliest bout of trouble had three to four irrigations a day for months; and in other years had threatened trouble similarly treated. This boy had no complications, no damage to his nose — has a family of his own and is now a combatant officer in Italy. When writing this paper I telephoned this mother and she hoped that I would tell you that irrigation can be done many times a day over long periods without any damage to a child providing the instructions are strictly followed.

The rhinologist or pediatrician should take great care to give typewritten instructions regarding irrigation, for he must try to avoid the dangers which are present when it is done at the wrong time or in the wrong manner.

L. H. L. Treatment: Because the anterior ethmoid cells, the frontal sinus and the maxillary sinus all drain into a common gutter, the middle meatus, I have found that treatment directed to the shrinking of this meatus is quite the most effective method of clearing sinus conditions in children. This treatment is carried out in the position and manner described by Parkinson and for the purposes of the hospital clinic I have named this treatment *lateral head-low treatment.*

Frequently in private practice I find it convenient to show a mother a model of the side wall of the nose as a means of explaining that the medicine must reach a gutter-like depression on the side wall of the nose and stay there long enough to shrink the openings to the sinuses and to be placed there in an amount which will not overflow. It is easy when holding this model to explain that if the head is tilted forward the solution will run out of the nose, and that if the head is tilted back it will flow down into the throat.

This series of photographs is in all the treatment wards of the hospital.

Fig. 8. Positions for treatment in the lateral head-low position.

This position is not good enough.

This position is correct.

This position would be bad.

The following prescription is issued:

Fig. 9.

Ear, Nose and Throat Department

THE HOSPITAL FOR SICK CHILDREN

Toronto, ...19.....

Please bring this paper with you each time you return

Rx1. Ephedrine, ½% in normal saline.

..... (oz.) two.

Sig. Clear Solution for spraying nose.

Rx2. Ephedrine (1% solution in normal saline).

..... (oz.) one.

Color pink.

Sig. Special drops for nose (put in eye-dropper bottle).

Rx3. One long curved bulb-tipped eye-dropper.

DIRECTIONS for use on attached sheet.

The following instructions are issued:

Fig. 10.

Ear, Nose and Throat Department
THE HOSPITAL FOR SICK CHILDREN

Toronto, ...19.....

INSTRUCTIONS

for

TREATMENT FOR NOSE—IN THE
LATERAL HEAD-LOW POSITION

1. Please carry out these instructions very carefully.
2. The following things are required:
   1. An atomizer containing the clear solution for spraying the nose.
   2. A small bottle of the special solution labeled—"Special Drops for the Nose."
   3. A large bulb-tipped dropper.
3. The metal parts of the atomizer should be well washed with warm water before and after each treatment. The eye-dropper should be boiled once a day and kept clean.
4. Spray each side of the child's nose with the clear solution. Wait five minutes.
   Then, make the child blow its nose.
   If you think the child's nose is still stuffy, spray it again and wait five minutes.
   If the child's nose seems clear enough, proceed with No. 5.
5. Make the child lie down on its side with its head on a pillow. You are going to put solution in the child's nose and you do not wish it to run out in front—or down into the throat. Therefore, the position of the head is important. The head should be horizontal. Be sure that it is neither tilted downward to the front or to the back.
6. Have the eye-dropper clean.
   Pour out a little of the special pink solution in a teaspoon and suck up about five or six drops into the eye-dropper.
7. Put the eye-dropper into the side of the child's nose that is closest to the pillow. Put it in about one inch gently. It should be pushed in the direction of the eye on the same side. When the eye-dropper is in this position press the bulb and take out the eye-dropper.
   This should leave the special solution in the child's nose in the proper position. It should remain there five minutes.
8. At the end of five minutes the child is to sit up, bend the head forward and blow the nose.
9. Then repeat 5, 6, 7 and 8 for the opposite side of the nose.
10. This treatment is to be carried out.....

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I have no other form of nasal treatment that compares with this in frequency of use and productiveness of good results.

Aspiration and Irrigation of the Maxillary Sinus by Puncture of the Nasoantral Wall: This is the most useful surgical procedure in the treatment of the severer forms of sinusitis in children. It is indicated not merely in cases of involvement of the maxillary sinus but also of involvement of the frontal and anterior ethmoid sinuses. It can be performed by passing a trocar and cannula under the inferior turbinal through the nasoantral wall under local anesthesia as painlessly as passing a cannula through the natural ostium, only much more easily. The trick lies in using a thin, short, straight, stiff instrument with a very sharp point. It does absolutely no damage. The presence of blood in the washing fluid, or bleeding following the procedure is rare if the technique is good. The fluid enters through the cannula and passes out through the natural ostium. When the operation is done under general anesthesia it is advisable to use a cannula of wider bore, for in this way macroscopic evidence can be obtained of the contents of the antrum.

Washing of Antrum via Natural Ostium: Many rhinologists advise and practice irrigation of the maxillary sinus via the natural ostium. The maxillary sinus has one natural ostium and this in a large percentage of skulls is not a simple ostium but a definite canal; this sinus also has one or more accessory ostia, some or all of which may be openings closed by membrane. Neither the natural nor the accessory ostia can be seen. Consequently the surgeon who passes a cannula through the middle meatus into the antrum cannot tell whether his cannula tip has entered the antrum through the natural or one of the accessory ostia or has passed through a thin part of the floor of the middle meatus. The anatomy of these openings has been described so that it should be apparent that such instrumentation must do damage to an area of great physiological importance.

Damage to this physiologically important area is one of the reasons for the adage "once a sinus always a sinus." An eminent rhinologist friend of mine once told me that he thought nothing of this procedure; it was perfectly simple and that many of his antrum patients would come for many

antrum washings every time that infectious colds were present. Anyhow, it was the fashion in his part of the country and that puncture under the inferior turbinate was taboo.

Many of my little patients with purulent maxillary sinusitis require only one — many others not more than two antrum irrigations by puncture. Why? Because for reasons given elsewhere no damage is done and recovery is facilitated; but when patients come to me who have had many irrigations via the middle meatus — or the so-called natural ostium route — permanent damage has been done and they nearly all require a nasoantral window.

Do not allow any child in your practice to have its antrum washed through the middle meatus.

Treatment of Sinusitis by Displacement: The displacement method can be used in adults for the instillation of saline, shrinking or antiseptic solutions into the sinuses. I have abandoned the displacement method of treating sinusitis in children because the difficulties of introducing a child under 12 to the treatment are very great. The procedure appears formidable to the mother and a fear complex is aroused in the child. The very young child must be mummied and gagged because it is essential to hold the child's mouth open to prevent its snorting the solution out of the nose before the suction can be used. Even older children submit to the procedure only when they are unusually self-controlled and I have never had one who was so comforted by the treatment that it desired it done when another attack of sinusitis required attention.

There is another serious objection to displacement therapy: there is a danger of spreading the infection to some of the sinuses not infected. When a patient has sinusitis, while some sinuses are infected or involved there may be, or probably are, many other adjacent sinuses which are not involved. Displacement permits the entry into these uninfected sinuses of the solution put into the nose. Displacement also permits discharge which has escaped from an infected sinus to get sucked into neighboring healthy sinuses which have a fully open ostium. The healthy sinuses are the ones most readily entered by the displacement solution and this

solution may carry infection from the nasal passages into the sinuses previously uninvolved.

It is possible to carry out this form of therapy on even the very young child — and repeat it — but you will lose the child's confidence and co-operation. The little patient will probably not return and as far as you are concerned you have effected a cure. If the case is kept in your hands — you are resisted and perhaps completely defeated in your subsequent attempts to use other methods.

Tampons or Packs: Tampons or packs soaked in various solutions, such as the mild silver proteins, glycerine and ichthyol, etc., are extensively prescribed by the general practitioner in the treatment of nasal sinusitis. They are mentioned here merely to condemn their use even when inserted in the gentlest fashion by the rhinologist. The solutions commonly prescribed are irritating and damaging to the mucous membrane. A gumming of the mucosa of the septum to the mucosa of the inferior turbinal follows and thus produces the stasis already demonstrated as the nasal condition it is so desirable to avoid. Their use by the practitioner who cannot examine a nose, and still more so by the parent entrusted with the treatment, results in damage to the nasal mucosa. They have a very limited rational use by the rhinologist only, in certain infrequent conditions. The use of tampons for children is a form of treatment which has passed out of the reputable textbooks and I hope will soon be abandoned by all physicians.

Short-Wave Therapy: My experience with short-wave therapy in the treatment of acute and chronic sinusitis has been limited to its use in private practice on physicians and surgeons who have been willing to allow me to try it experimentally. Invariably it has increased the discomfort of the patient unless the middle meatus had been well shrunken previously and in no instance in over five years' trial have we felt that it has produced a benefit comparable to that produced by gentle shrinkage plus irrigation when necessary; therefore, when asked regarding it, I invariably advise against short-wave therapy in the treatment of sinusitis in children.

Treatment of Sinusitis by X-ray: Exposure to appropriate dosage of X-ray can diminish the activity of glandular and

lymph structures, but I am not aware of reliable evidence that it can favorably affect infection in or the thickened lining membrane of nasal sinuses; therefore, no children have been treated for sinusitis by X-ray in our hospital.

Therapy by Sulpha Drugs: It is not possible to give a statistical estimate of the efficacy of sulpha drug therapy for sinusitis in children at our hospital. Children suffering from acute upper respiratory infections are seen by the medical service long before they are seen by the nose and throat service. They receive treatment with the various sulpha drugs as indicated. In some cases sinusitis is at least suspected. Opinion regarding the efficacy of sulpha drug therapy is not unanimous, but there is certainly general belief that sulpha drug therapy in many cases of sinusitis has been effectual. Only an occasional case of severe upper respiratory infection that has received early and adequate sulpha drug therapy has developed meningitis. The recovery of certain cases of orbital cellulitis has been credited to sulpha drug therapy. Those who disagree with this conclusion point out that cases of orbital cellulitis secondary to sinusitis subsided under other therapy prior to the advent of the sulpha drugs. The medical service was recently surprised when one such case did not clear up and had to be referred to the nose and throat service for surgery.

The medical service tends to see all the recoveries under sulpha drug therapy; the ear, nose and throat service sees some that do not and the practice of the latter service is then to treat the surgical condition on surgical principles.

I have seen many cases of sinusitis in private practice which have failed to clear under sulpha drug therapy, and I have seen some of these promptly respond to measures described elsewhere in this paper. I am afraid of chronic sinusitis developing and, therefore, am personally against *protracted* sulpha drug treatment for acute and subacute sinusitis.

Surgery: Children suffering from sinus infections on the whole do not recover because of major surgical procedures performed by a surgeon of marvelous dexterity. They recover because of a combination of: accurate diagnosis based on careful examination; treatment carried out with gentleness

by the hand that made the examination; operative procedures which were properly indicated and which were carried out without damage to surrounding areas; postoperative treatment carried out by the hand which operated.

I take issue with the rhinologist who wants to know whether the Smith Jones or the Jones Smith operation should be done on a certain little patient with a sinus infection. Every such patient should be a law unto himself. The surgeon's first task is to know accurately the patient's condition, devise a procedure which can logically be expected to improve that condition and then have the skill to do exactly the amount planned and no more. He must endeavor to do enough to enable a natural recovery; and his duties do not stop here — for he must continue personally to do the after-treatment so that nature may not be defeated in achieving the recovery of the patient. Unfortunately, sometimes the pediatrician does not appreciate this.

All of us, pediatrician and otolaryngologist alike, suffer from a state of mind regarding surgery which we have imbibed from teaching and example. During our undergraduate and postgraduate training it has been the fashion for interest to be centered on outstanding pathological conditions for which such and such operative procedures were recommended. The pros and cons of these were discussed and that surgeon was greatest who would tackle the manipulation in the most drastic manner. It was never taught that a surgical procedure may turn a patient into a surgical cripple. There was never any discussion of what the postoperative course would be or of how long postoperative treatment would have to be carried out or of what disabilities the patient would have for the rest of his life. Good surgery consists not in doing a master stroke of handicraft but in returning a patient to as good physiological activity as possible with a minimum of impairment of function.

Submucous resection of an inferior turbinate is mentioned only that it may be condemned. Consideration of such a procedure implies a complete lack of knowledge of the vital importance of the specialized bone structure described earlier in this paper.

Reduction of the Middle Turbinate: The removal of the front third of the middle turbinate is a justifiable nasal oper-

ation on a child to relieve certain conditions: recovery is relatively fast and no nasal impairment should follow. It is justified when swelling of the front end of the turbinal blocks the middle meatus and thus is the factor which jeopardizes the recovery from maxillary, frontal or ethmoidal sinusitis. The middle turbinate is not one of the bones of the head, it is a bony process of the ethmoid and not infrequently contains an ethmoid cell which sometimes may be infected. The success of treatment depends entirely on recognition of this localized sinusitis. Sometimes removal of the part of the turbinate containing such an infected cell is required for the cure of the sinusitis.

Reduction, Coagulation, Cauterization, Crushing, etc., of an Inferior Turbinate: These procedures have been advised and are being practiced; they are mentioned so that they may be completely condemned. The anatomical considerations earlier described should indicate that the inferior turbinate is a structure of great physiological importance. No matter what its appearance or size, disturbance of an infeior turbinate in a child is practically never primary; it is always secondary to disease or abnormality elsewhere in the nose. The inferior turbinate in a child is practically never diseased — it is practically never infected. No matter what its appearance and size, it is nearly always capable of returning eventually to normal health. Very rarely a curled lower edge of an inferior turbinate will prove the exception to the rule.

Major Surgical Procedures: Removal of polypi, antrostomy, radical antrum operation, partial ethmoid exenteration, the external ethmoid operation, frontal sinus operation must be performed when necessary. In proportion to the number of children attended, the number of radical antrum operations, for instance, is very small, and the radical antrum operation is by far the most frequently performed of all these major procedures. We are united in saying that the surgical measures adopted should be as conservative as possible.

CONCLUSION.

Children can recover from almost anything, given an opportunity. Chronic sinus disease of a mild degree in children is common. In many cases it is possible to assist recovery by

treatment alone. The treatment for sinus disease in children is, therefore, to recognize its presence early and so treat acute or widespread sinus disease that the lesion does not become chronic.

If methods of treatment are adopted which do not violate important anatomical structure and which are in accord with physiological principles, the ability of the rhinologist to treat sinusitis in children therapeutically and surgically will cease to deserve skepticism.

REFERENCES.

1. Porter, Charles T.: Sinusitis: The Present Rationale of Treatment. *Ann. Otol., Rhinol. and Laryngol.*, 48:769, 1939.

2. Proetz, Arthur W.: Essays on the Applied Physiology of the Nose. Annals Publishing Co., 1941.

3. Burnham, Howard H.: An Anatomical Investigation of the Blood Vessels of the Lateral Nasal Wall and Their Relation to Turbinates and Sinuses. *Jour. Laryngol. and Otol.*, 50:569, Aug., 1935.

4. Knisley, M. H.: Microscopic Observations of the Circulatory System of Living Mammalian Spleens. *Anatomical Rec.*, 65:23, April, 1936.

5. Ebbs, J. H.: The Incidence of Sinusitis in Children. *Brit. Med. Jour.*, 385, Feb., 1938.

6. Walsh, Theo. E., and Lindsay, John R.: Cytology of Nasal Polypi. *Arch. Otolaryngol.*, 20:649-658, Nov., 1934.

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MUSCULATURE VARIATIONS OF THE PHARYNGOESOPHAGEAL SEGMENT.*†

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HISTORY.

The earliest detailed anatomical work on the pharyngoesophageal segment was done by Edward Laimer[1] in 1883. Earlier writers described the pharynx and esophagus and mentioned the change in direction of the muscle fibres of the pharynx from those of the esophagus. William Lerche,[2] in 1936, translated in the *Journal of Thoracic Surgery* the work of Edward Laimer. Laimer therein established the muscular arrangement of the pharynx and the esophagus. He described an inverted triangle with its point downward and its boundaries formed by the cricopharyngeus and lateral longitudinal muscle bands of the esophagus.

Since Laimer's work, interest in the areas of deficiencies of the muscular coats of the esophagus have been centered chiefly around this triangular undefended space on the posterior wall in the upper third so accurately described. At that time 50 bodies were studied and other observers have confirmed his observations.

Laimer described the lateral bundles which attach by a fibroelastic strip from the upper part of the median ridge on the posterior surface of the cricoid. He noted that the muscle bundles did not completely surround the esophagus in the upper third. They descended on the anterior surface as a thick band and passed obliquely posterior to unite below at a distance varying from 2 to 5 cm. from the inferior border of the cricoid: Thus he established a triangular area of muscular deficiency since known as Laimer's triangle.

He also described the inferior constrictor muscle and noted that occasionally the horizontal fibres spread out to cover this weakened area. The observations he made have formed the basis of much anatomical investigation and research.

Following his work, Haeckermann[3] was the first to study the muscular coats of the esophagus from the clinical point

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of view. In 1891, he described a museum specimen of diverticulum in which the musculature showed that the herniation had its origin in the esophageal triangle on the posterior surface of the upper third of the esophagus. His paper brought forth much discussion and this area has been called the Laimer-Haeckermann triangle. Since the work of Haeckermann, in 1891, no record has been made of a detailed anatomical dissection surrounding a mature diverticulum.

The literature on herniations or pouches of the pharynx and esophagus was reviewed, in preparing this paper, for the purpose of obtaining any detailed anatomy described. Many authorities have written on the subject of diverticulum and various theories have been advanced in regard to their formation. No mention was found of muscular variations of the pharyngoesophageal segment as presented in this paper.

In 1764, A. Ludlow,[4] an English surgeon, first reported an esophageal pouch found at autopsy. He reported his case as one of "Obstructed Deglutition from an Unnatural Dilation of the Esophagus." His paper was illustrated but gave no discussion of the pathological anatomy. This paper is mentioned, therefore, only because it was the first such case on record.

Monroe,[5] of Edinburgh, in 1811, described these pouches, discussed their formation and considered them pharyngeal in origin. The first clinical case was diagnosed in 1816 by Sir Charles Bell.[6] He agreed with the idea of pharyngeal origin and suggested that they were due to abnormal pharyngeal pressure. The treatment he suggested was that of surgical drainage. A paper by Rokitansky,[7] in 1840, classified the pharyngeal pouches into two types as traction or pulsion. This classification is still accepted. But not until 1877 did F. A. Zenker[8] discuss their associated anatomy. He was the first to describe these pouches as hernias of the mucous membrane of the pharynx and advise surgical treatment. This lesion has since been known as Zenker's diverticulum. In his anatomical discussion he stated that the sac was composed of the same membranes of the pharynx and esophagus. He noted muscle fibres on the neck of the sac but did not classify them, although he considered those present as cricopharyngeal. His paper covered all cases reported from 1764 to 1877,

or 27 cases. Twenty-two he found in the literature and five were from his own clinic. Hypothetically, he believed that the diverticulum was the result of a tearing of the pharyngeal wall.

After this publication, anatomical interest in this region was stimulated, which led to the work of Edward Laimer in 1883.

Whitehead,[9] in 1891, reported a case where the sac of the diverticulum was composed of all three coats, the mucosa, submucosa and muscularis.

Haeckermann, in 1891, described a diverticulum which had its origin from the esophagus.

After that, anatomical findings, in relation to diverticula, were mentioned by authors as they reported such cases and much controversy has followed.

Killian,[10] in 1908, was the first to discuss the anatomy of the pharynx and to indicate that the pouch originated between the fibres of the inferior constrictor. He also mentioned a slit below the cricopharyngeus through which pass the recurrent laryngeal nerve and inferior thyroid artery. He explained double sac formation as due to a large branch of the inferior thyroid artery which, too resistant to yield, caused a bifurcation of the sac.

Keith,[11] in 1910, reported 10 cases of diverticulum and believed them to have originated from the pharynx. The youngest age was 45 years. He also denounced Moynihan's congenital sac theory associated with branchial clefts because pulsion diverticula are never found in the fetus or newborn.

Kulenkampff,[12] in 1921, stated that diverticulum of the esophagus is a condition analagous to the various diverticula of the intestinal tract, in that there pre-exists a congenital defect through which the unprotected mucous membranes prolapse.

Moynihan,[13] in 1927, insisted that these pouches were pharyngeal and stated that there were recorded cases arising from Laimer's triangle. He advanced three types; the first were associated with branchial clefts, the second were pharyngeal, and a third, lateral type of diverticula which arose below the cricopharyngeus, at a weak point

between the esophageal and pharyngeal muscles. This space was lateral and evidently was the slit described by Killian. He believed these lateral types to be more indefinite in origin than those arising in the pharynx.

Chevalier Jackson,[14] in 1933, stated that the weak points for herniations were hypopharyngeal, above the inferior constrictor, or perhaps between its fibres, and believed at that time that the pouches were pharyngeal in origin.

Harris P. Mosher,[15] in 1935, observed an asymmetry of the thyroid cartilage but associated muscular asymmetry was not described.

In five cases of pharyngeal diverticula he noted the mouth of the esophagus was obliterated for half its transverse diamter. He reasons that this asymmetry put the tension of the inferior constrictors off center, thus contributing to diverticulum formation.

Thomas Shallow,[16] in 1936, advanced the theory that diverticulum may originate at any portion of the pharynx which is perforated by a branch of the inferior thyroid artery. He has seen sacs that originate at such vulnerable spots as above the cricopharyngeus, and through the lower portion of the cricopharyngeus itself. Shallow, finding the inferior thyroid artery crossing the fundus of the hernial sac, believed it to be further evidence that herniation began in the slit where the artery enters the hiatus of Killian.

Negus,[17] in 1938, expressed his conviction that the pharyngeal weakness is brought about by the evolutionary descent of the larynx in man. "Inco-ordination of the muscle fibres may, through the strain on the posterior pharyngeal wall gradually cause herniation of the mucous membranes at that point."

J. Terracol and L. Nichet,[18] in 1937, published a very comprehensive study of the pharyngoesophageal segment. Their study was made from the viewpoint of difficulties arising in problems of esophagoscopy. The normal anatomy was presented and the configuration of the muscle fibres illustrated in detail. Two well defined undefended triangles in the pharyngoesophageal segment were identified. They confirmed the triangle of Laimer located below the most inferior fibres of the inferior constrictor muscle, and demonstrated the firm

attachment of the esophageal muscle coat to the cricoid by means of a fibroelastic ligament. (Ligament of Gillette or anterior suspensory ligament of esophagus.)

ANATOMICAL PRESENTATION.

Through the courtesy of the Department of Anatomy of Rush Medical College, University of Illinois College of Medicine and Northwestern University, Department of Anatomy, the pharyngoesophageal segment of 41 bodies was studied.

This anatomical work was directed to the muscular coat surrounding the esophagus with special attention to the so-called esophageal triangle located below the cricopharyngeus.

The pharyngoesophageal segment was firmly attached to the structures anteriorly, while posteriorly it adhered to the cervical portion of the vertebral structures only by means of loose areolar tissue. Separation between the pharynx and prevertebral muscles was therefore easily accomplished.

Reviewing the musculature of the pharynx, the majority of the inferior constrictor fibres were seen to ascend obliquely and insert into the median raphé. The most inferior fibres coursed horizontally and overlapped the beginning of the esophagus. Because of the specialized function and definite origin of these horizontal fibres from the cricoid, they are usually identified separately as the cricopharyngeus muscle. The major portion of these inferior fibres coursed horizontally and decussated with those of the opposite side, while some few looped around and attached themselves to the esophagus. The remaining fibres had a scattered and very indefinite course. The cricopharyngeus, therefore, can be said to present a very disseminated type of fibre arrangement. This muscle band varied in width from 2 to 6 cm. To palpation, certain specimens showed it varied greatly in thickness, the variation being due to the number of horizontal muscle fibres present.

Grossly, the structures above the cricopharyngeus, including the mucosa, pharyngeal aponeurosis and muscle fibres, were noted to be much firmer and thicker to palpation than those below. The longitudinal bands of the esophagus were seen to arise by means of the elastic ligament from the cricoid cartilage. They descended obliquely on each side, spread-

ing out to encircle the upper end, and united below at varying distances on the posterior surface of the esophagus. The direction of their fibre arrangement was directly opposite to that of the pharyngeal muscles.

These dissections show clearly that the structure, as well as the distribution of the muscle bands over the posterior surface of the esophagus, causes a marked variation in the muscular protection of the pharyngoesophageal segment.

TABLE.

AUTOPSY DATA WITH TRIANGLE MEASUREMENTS.

Adult Specimens	Sex	Age	Color	Base (In centimeters)	Right	Left
1	M	Old	W	1	1	1
2 Fig. IV	M	Old	Col		(Triangle absent)	
3	M	Mid-Age	W	1.3	1	1.2
4	M	Old	W	1.1	1.9	1.9
5 Fig. V	M	Mid-Age	W	2.1	6	6
6	M	Mid-Age	W	1.1	1.5	1.5
7	F	Old	W	.5	1	1
8	M	Old	W	1	1	1
9	M	Old	W	1.5	1.5	1.5
10	M	Old	W	.75	1	1
11	M	Old	W	1	.75	.75
12 Fig. VI		9 mo. fetus	W	.5	.5	.5
13	M	Old	W	.75	1	1
14	M	Old	W	1	1.2	1.2
15	M	Old	W	1	1.2	1.2
16	F	Old	Col	.75	1.5	1.5
17	F	Old	W	.75	1	1
18 Mutilated						
19	M	Old	W	2.5	2.5	2.5
20	M	Old	Col	1.5	2	2
21	F	Old	Col			
22	M	Old	W	1.5	1.5	1.5
23 Mutilated	F		Col			
24 Mutilated	M	Young	W			
25	M	Old	W	1.2	1.5	1.5
26	M	Old	W	1.75	2	2
27 Fig. III	F	Old	Col	1 4	2.75	2.4
28 Fig. I	F	Old	Col	1	1.5	1.5
29	M	Old	W	1.5	1.5	1.75
30	M	Old	W	1	1.75	1.5
31	M	Old	Col	1.5	1.5	1.5
32 Fig. II	M	Old	W	2	3.3	3.5
33	M	Old		.75	1	1
34	M	Mid-Age	Col	.6	.7	.7
35	M	Old	W	1	1.2	1.2
36	F	Old	Col	.75	1	1
37	M	Old	W	1.5	2.5	2.5
38	M	Old	Col	1.5	1.9	1.9
39	F	Old	Col	1	1	1
40	M	Old	W	1.5	1.5	1.5
41	F	Old	Col	1	1.5	1.5

The illustrations used are the artist's interpretation of the gross specimens as seen at the time of dissection. Fig. 1 illustrates the symmetrical muscular distribution as seen in the majority of the specimens. The undefended area of the esophageal wall was the shape of an isoceles triangle situated in the midline, measuring 1x1.5x1.5 cm. A variation in the distribution of the muscle fibres of the lateral esophageal bands

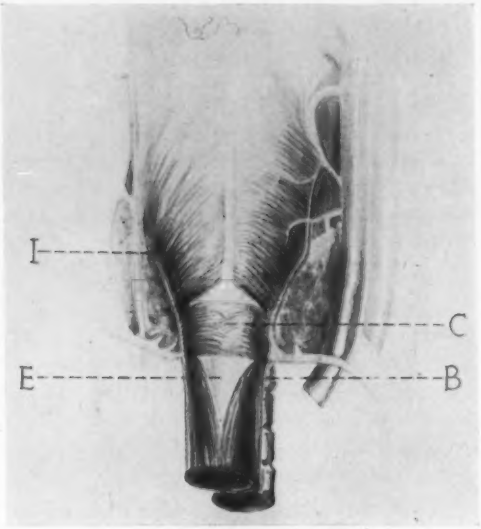

Fig. 1.

is illustrated in Figs. 2 and 3. The triangular area illustrated shows definitely the variation in size as well as the variation in shape from an isoceles to a right or left oblique triangle.

These observations from my specimens show clearly that the degree of lateral displacement of the exposed triangles is due to the relative widths of the longitudinal bands. Fig. 2, indicates a specimen whose musculature forms a left oblique triangle, also the fact that the longitudinal band of the left presented fewer fibres over the posterior surface of the esophagus than the corresponding band on the right. These fibres not only varied in number but varied in their quality and texture. Fig. 3 shows a muscular distribution which results

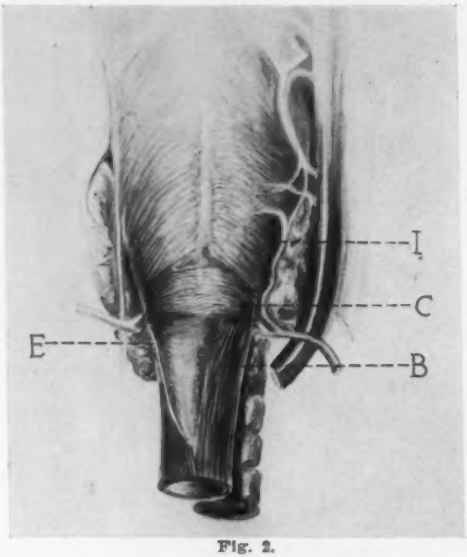

Fig. 2.

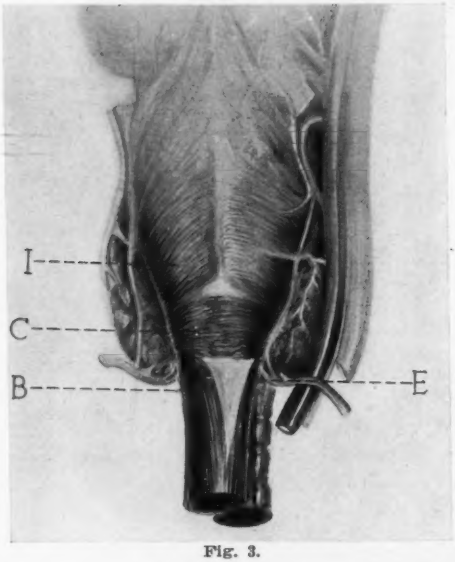

Fig. 3.

in a right oblique triangle. Fig. 4 shows the complete absence of Laimer's triangle. The cricopharyngeal fibres spread out

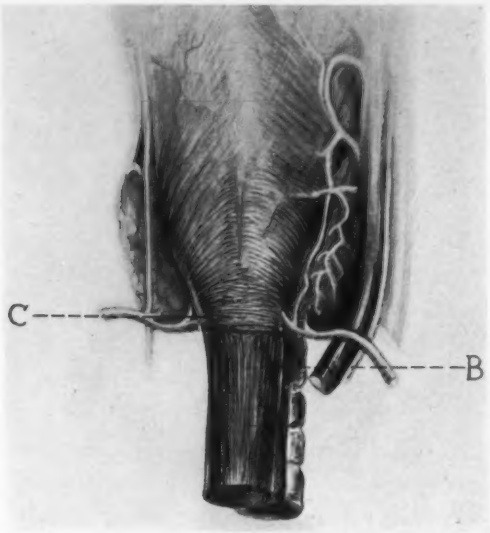

Fig. 4.

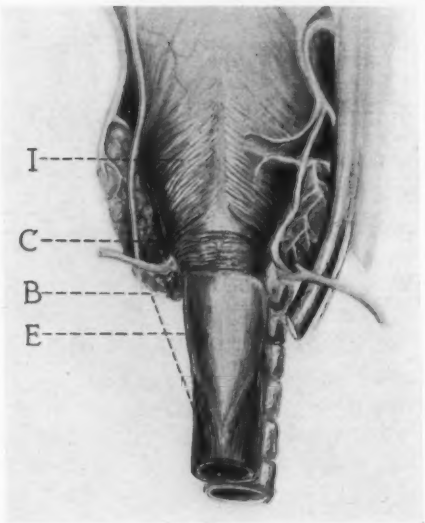

Fig. 5.

to cover completely the area of separation between the longitudinal bands. Fig. 5 shows the opposite extreme where the

esophagus was totally exposed for a distance of 6 cm. The longitudinal bands here were very narrow, the fibres few in number and the esophagus unprotected by the muscular coat for two-thirds of its circumference.

With an embryologic viewpoint in mind, a full-term fetus was dissected to establish the presence of a separation of the longitudinal bands at birth. Serial sections of a 10-week fetus demonstrated that separation of these longitudinal fibres of the esophagus at the cephalic end of the embryo was already complete.

CONCLUSIONS.

Hernias in general bear direct relationship to tissue integrity and muscular protection. With muscular variations present, we have an additional contributing factor to hernial formation. Correlation of the muscular variations and deficiencies to the different types of hernias in other regions has been established. For example, one of the most common variations in the muscular distribution, as well as variations in the quality and number of muscle fibres, is found by the surgeon in the inguinal region. Variations in the structure as well as the distribution of the muscle fibres to the conjoined tendon are frequent. Most inguinal hernias show variations in the number of muscle fibres attaching into the conjoined tendon. These variations are all the way from a solid attachment of the entire group of muscle fibres to the symphysis pubis to a distribution where most all of the fibres disappear under the anterior sheath of the rectus. The greater the variation in number of muscle fibres passing under the anterior sheath of the rectus, the greater becomes the undefended triangle of Hesselbach.

Pulsion diverticulum of the esophagus may be said to bear the same direct relationship to congenital muscular variations of the pharyngoesophageal segment and variations in Laimer's triangle as does inguinal hernia to the triangle of Hesselbach.

Here, also, there may be not only a variation in the number of muscle fibres attaching into the tendon of Gillette but a variation in the distribution, quality and number of muscle fibres diverging over the posterior surface of the esophagus.

This muscle fibre diversity results in alterations of size, shape and configuration of Laimer's triangle, thus making it, as is the triangle of Hesselbach, a vulnerable point for herniation.

SUMMARY.

1. Muscular variations in pharyngoesophageal segment presented.

2. Variations in the distribution of the muscle fibers over the posterior surface of the pharyngo-esophageal segment noted.

3. Variations in the size, shape and displacement of the esophageal triangle described.

BIBLIOGRAPHY.

1. LAIMER, EDWARD: Beitrag zur Anatomie des Esophagus. Med. Jahrb. 1883, pp. 333-388.

2. LERCHE, WILLIAM.: The Muscular Coat of the Esophagus and its Defects. *J. Thoracic Surg.*, 1936, 6:1-19.

3. HAECKERMANN, KARL.: Beitrag zur Lehre von der Enstehung der Divertikel des Oesophagus. W. F. Kaestner, Gottingen, 1891.

4. LUDLOW, A.: Obstructed Deglutition, from a Preternatural Dilation of, and Bag Formed in the Pharynx. *M. Obs. Soc. Physicians*, London, 1762-1767, 3:85-101.

5. MONROE.: Morbid Anatomy of the Gullet. 1811.

6. BELL, SIR CHARLES.: Surgical Observations. Longman (and others), pp. 64-70, 1816.

7. ROKITANSKY, KARL.: Spindelformige Erweiterung der Speiserohre. *Med. Jahrb. d.k.k. osterr. Staates*, 21:219-222, 1840.

8. ZENKER, F. A.: Krankheiten des Oesophagus, in H. von Ziemssen's Handbuch der speciellen Pathologie und Therapie, Leipzig. F. C. Vogel, 7:50-87, 1877.

9. WHITEHEAD, WALTER.: Diverticulum of Esophagus Causing Obstruction. *Lancet*, 1:11, 1891.

10. KILLIAN, G.: Uber den Mund der Speiserohre. *Ztschr. f. Ohrenh.*, 55:1, 1908.

11. KEITH, ARTHUR: Diverticula of the Alimentary Tract of Congenital or Obscure Origin. *Brit. M. Jour.*, 1:376-380, February, 1910.

12. KULENKAMPFF, D.: Etiology, Diagnosis and Therapy of the So-called Pulsions Diverticulum of the Esophagus. *Beitr. z. klin. Chir.*, 124:487-515, 1921.

13. MOYNIHAN, SIR BERKELEY: Diverticula of the Alimentary Canal. *Lancet*, 1:1061, May 21, 1927.

14. CHEVALIER, JACKSON, and CHEVALIER JACKSON, JR.: Pulsions Diver-

ticulum of the Esophagus and Hypopharynx. *Southern Surgeon*, 2:255-266, December, 1933.

15. Mosher, Harris P.: The Esophaguss. *Surg. Gynec. and Obst.*, 60:403-417, February, 1935.

16. Shallow, Thomas A.: Combined One Stage Closed Method for the Treatment of Pharyngeal Diverticula. *Sur. Gynec. and Obst.*, 62:624-633, March, 1936.

17. Negus, V. E.: Affections of the Cricopharyngeal Fold. The Laryngoscope, 48:847-858, December, 1938.

18. Terracol, J. and L. Nichet: Le Segment Paryngo-Esophagus. *Revue de Laryngologie, Otologie, Rhinologie*, 58:150-185, February, 1937.

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AMERICAN BOARD OF OTOLARYNGOLOGY.

The next examination of the American Board of Otolaryngology will be held in New York City at the Waldorf-Astoria Hotel, June 1-2-3-4, 1944.

ESOPHAGOPHARYNX, A SPECIAL AREA OF THE HUMAN PHARYNX.*

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To the recognized areas: Nasopharynx, Oropharynx and Laryngopharynx, a fourth subdivision, Esophagopharynx, may well be considered. Here the lower muscle fibres of the inferior constrictor pharyngis are arranged in circular form (sphincteric) and are supplied by the recurrent laryngeal nerve (vagal and spinal accessory elements, with a communicating branch from the cervical sympathetic).[1,2]

It will be observed that the area of esophagopharynx exists in comparative literature. Chauveau, Arloing and Fleming[3] describe very clearly (p. 449) the cricoesophageal (muscle), which leaves the deep face of the cricopharyngeus to pass to the border of the esophagus, where its fibres proceed above and below that tube, in joining those of the muscle of the opposite side. This muscle compresses the esophagus at its commencement in the same way as Wilson's muscle acts upon the (bulb of the) urethra.[4]

In man, we find an elaborate arrangement of muscle fibres at the lower margin of the inferior constrictor of the pharynx. The two palatopharyngeus muscles descend to mingle with the muscle of the esophagus which is, therefore, directly suspended from the skull (palate bone).[5,6,7,8]

Other muscle fasciculi are mingled within the walls of the esophagopharynx; the dorsomedian constrictor raphé receives the single or bilateral occipitopharyngeus, and the stylopharyngeus muscle sends fibres downwards. McMurrich in Piersol[1] says, "additional muscles are very common, being chiefly longitudinal bundles," "bands may arise at the side from the petrous portion of the temporal bone or the spine of the sphenoid."

We conclude that the area of the esophagopharynx is a separate structural entity, and its specific and separate activ-

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ity is chiefly to support the upper ostium of the esophagus against which the bolus is forced and to close down in a sphincteric manner upon the bolus as it is received within the tube of the esophagus. There may be additional actions, related to the support of the cricoid cartilage. Remembering that the mucous membrane of the ventral wall of the esophagopharynx is supplied by internal laryngeal twigs of superior laryngeal nerve[9] and that clinically the movements of the cricoid are conditioned not alone by the cricothyroid muscle but also by the cricopharyngeus portion of inferior constrictor of the pharynx,[1,10,11] with a differentiation in circular fibres just proximal to upper ostium of esophagus, we observe that a contraction area almost ring-like and similar to that of a muscular "bulb" is produced (A. Chauveau, S. Arloing, George Fleming, loc. cit., p. 449).

It is reasonable, then, to designate this distal part of the pharynx as that of the esophagopharynx.

REFERENCES.

1. (a) Piersol, George Arthur: Human *Anatomy*, II:1272-1606, 4th ed., Lippincott, Philadelphia, 1913.

(b) Morris, Henry: Human Anatomy, p. 990, 8th ed., Blakiston, Philadelphia, 1925.

2. Cunningham, D. J.: Textbook of Anatomy, pp. 570 and 1003, 8th ed., Oxford Univ. Press, London-New York, 1943..

3. Chauveau, A.; Arloing, S., and Fleming, George: Anatomy of the Domesticated Animals, pp. 442, 444, 449, 2nd Eng. ed., D. Appleton & Co., New York, 1908.

4. Dorland: American Illustrated Medical Dictionary p. 600, 7th ed. revised, Saunders, Philadelphia, 1913 (Muscle—Wilson's).

5. Piersol: Loc. cit., p. 1571.

6. Cunningham: Loc. cit., p. 421.

7. Morris: Loc. cit., p. 1169.

8. Cunningham: Loc. cit., p. 574.

9. Morris: Loc. cit., p. 1079.

10: Morris: Loc. cit., p. 1282.

11. Cunningham: Loc. cit., p. 421.

TWO CASES OF OSTEOMYELITIS TREATED WITH PENICILLIN:

CASE 1, FRONTAL; CASE 2, MAXILLARY.*†

SAMUEL IGLAUER, M.D., Cincinnati.

During the past year the subject of penicillin therapy has been under intensive investigation by the Committee on Chemotherapeutics of the National Research Council. This committee, under the chairmanship of Dr. Chester S. Keefer, conducted clinical investigations in twenty-two accredited hospitals in various parts of the country and recently published its first report (five hundred cases).[1] The results obtained in many of these cases were exceedingly gratifying and truly remarkable.

A second committee appointed by the Surgeon General and directed by Major Champ Lyons has just recently issued a report on "Penicillin Therapy of Surgical Infections in the U. S. Army."[2] This report, covering two hundred and nine cases, was equally startling and encouraging.

Both committees list infections of the most varied character but without detailed reports or analyses of any individual cases; however, more specific data are to be published later.[1, 3]

The numerous cases of osteomyelitis which were treated are of special interest to the rhinologist in whose practice osteomyelitis of the skull or facial bones constitutes one of the most serious complications which he encounters. Lyons lists four cases of osteomyelitis of the skull and one case of osteomyelitis of the mandible as improved. Keefer and his coworkers encountered some similar cases, but the exact number is not stated. These cases are be reported in detail after further study and analysis.[3]

As you are all aware, the manufacture and distribution of penicillin is under strict governmental control and there is but a limited supply available. Fortunately, the Cincinnati

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*Presented at the Middle Section Meeting of the American Laryngological, Rhinological and Otological Society, Inc., Cleveland, Jan. 12, 1944.

†From the Department of Otolaryngology of Cincinnati General and Children's Hospital; Medical College, University of Cincinnati.

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General Hospital is among the twenty-two hospitals commissioned to study penicillin with Dr. W. A. Altemeier as the accredited clinical investigator in charge. Through his interest and under his guidance we were very fortunate in obtaining and using the penicillin which was administered in the two following cases.*

Case 1: D. W., colored female, 12 years old, was admitted to the Ear, Nose and Throat Service of the Cincinnati General Hospital, Aug. 31, 1943.

Chief Complaint: Swollen left face, puffiness of eyes and high temperature.

Previous History: Patient had been in a fight ten days before admission and was hit with a stick on left forehead and bridge of nose. There was no nose bleed. Five days later the patient complained of headache and fever. Four days before admission the patient's face began to swell and she had puffiness of the eyes. (There was no history of a head cold.)

Physical Examination: The patient appeared fairly alert on admission to the ward, but within an hour became stuporous and was aroused only on painful stimulation.

A spinal tap, done on admission, was essentially negative. The Roentgenograms showed clouding of the central portions of both frontal sinuses which had multiple compartments. There was slight clouding of both ethmoids. No fracture could be detected.

T 106, P 160, R 38, WBC 16,000, RBC 4,100,000; urine negative. The examination revealed a marked edema of frontal region immediately above the eyes. The nose revealed some purulent discharge from the left middle meatus. The mouth, chest, abdomen, extremities and reflexes were essentially normal.

Tentative differential diagnoses of acute frontal sinusitis, possible skull fracture, epi-dural abscess, frontal lobe abscess, cavernous sinus thrombosis and osteomyelitis of the frontal bone with orbital involvement were considered at this time.

Treatment: Her treatment consisted of: Sulfadiazine gm. i q. 4 h, 2 per cent Ephedrine nose drops and forced fluids. A blood culture, taken at this time, was positive for hemolytic staphylococcus aureus.

Operation, Sept. 1, 1943: Since the simple treatment outlined above did not relieve the patient, a trephine opening was made in the floor of each frontal sinus and rubber drains were inserted. Pus, under pressure, was found in each sinus, more so on the left. Culture was taken and found to be hemolytic staphylococcus aureus.

Sept. 3, 1943: In spite of the drainage of the sinuses, hot wet dressings and Sulfa therapy, the patient continued to become worse. The edema of the left eye increased and there was some chemosis and slight proptosis of the left eye. Movements of the globe were apparently not hindered. Ophthalmologic and pediatric consultations were obtained.

Sept. 4, 1943: The ophthalmologist felt that there might be some retro-orbital pus but that no cavernous sinus thrombosis was present. The fundi were normal. The pediatrician suggested another spinal tap. This

*The penicillin was provided by the Office of Scientific Research and Development from supplies assigned by the Committee on Medical Research for clinical investigations recommended by the Committee on Chemotherapeutic and other Agents of the National Research Council.

was done but proved essentially negative. Blood culture remained positive for staphylococcus aureus.

Second Operation, Sept. 4, 1943: In view of the continued downward course of the patient and the hemolytic staphylococcus aureus septicemia, an exploratory operation of both frontal sinuses was performed. Under general intratracheal anesthesia the original incisions were enlarged and the periosteum elevated over the anterior plate of both frontal sinuses. The anterior plate of both sinuses was removed; the left was found to be soft and of beginning mushy consistency. The posterior plates of the frontal sinuses were removed for an area about the size of a dime on each side. The dura appeared to be normal. A spontaneous opening between the frontal sinuses was noted. The sinuses were washed and filled with sulfanilimide powder; rubber wicks were sutured in place.

Following the operation, the sulfa drug was discontinued. A period of twelve hours was allowed to elapse before the patient was put on Penicillin (10,000 units intravenously q. 4 h).

Sept. 5, 1943: The patient appeared much better clinically. Temperature was down to 100.6 and she was responding fairly well. The white blood count had come up to 25,200 and urine was negative. Blood culture still remained positive.

Sept. 6, 1943: Blood culture was found to be negative for the first time since hospital admission. Temperature returned to around 102; white blood count was still around 23,000 and the Penicillin therapy was being continued 10,000 units q 4 h I. V.

Sept. 8, 1943: The patient still continued a stormy clinical course. X-rays at this time showed clouding of all the sinuses, especially the left frontal and antrum. The white count had slowly fallen to 18,700. Hot packs to the left face, eye and forehead had been continued since the start.

Sept. 9, 1943: Penicillin decreased from 10,000 units q. 4 h. to 5,000 units q. 4 h.

Sept. 10, 1943: The patient was definitely better. The temperature had reached normal for the first time since admission. The blood count had dropped to 14,500.

Sept. 11, 1943: Penicillin therapy discontinued after the 4:00 A.M. dose.

Sept. 15, 1943: The patient was clinically well. The chemosis and proptosis had completely disappeared and there was normal movement of the eyeball. (Fig. 1).

The packs from the frontal sinuses were removed and the wound was granulating nicely. The white count had fallen to 14,200. No attempt was made at this time to close the frontal sinus wounds. Urine continued negative.

Sept. 30, 1943: The patient continued well and both incisions were completely healed. Peculiarly enough there was no bone defect visible in the frontal areas. The nose was clear and the rest of the ear, nose and throat findings were negative with the exception of a cloudy left antrum.

Oct. 5. 1943: Patient was dismissed to her home. She was told to return to the Ear, Nose and Throat Clinic in two weeks.

Oct. 20, 1943: Patient presented herself at the Clinic with acute coryza and pain in her left frontal region. She was immediately admitted to the hospital for treatment. She was kept in the hospital two days and dismissed apparently well again. X-rays at this time were essentially negative.

Oct. 27, 1943: Patient presented herself to the Clinic complaining of double vision. Examination was essentially negative from an ear, nose

and throat standpoint, and the patient was referred to the Eye Clinic. Here it was believed that the dense scar of skin in the trochlear areas had contracted upward causing a bilateral hypertropia. The impression was that the right was worse than the left eye. They advised a plastic skin operation and a vertical muscle operation. Later, since the patient had not presented herself to the Clinic for two months, we felt that her eyes had accommodated themselves to the vertical hypertropia.

Discussion: Ten days after a blow on the forehead, the patient was admitted with a high fever and with marked swelling in the frontal region. There was a purulent discharge from the left middle meatus. The patient became stuporous

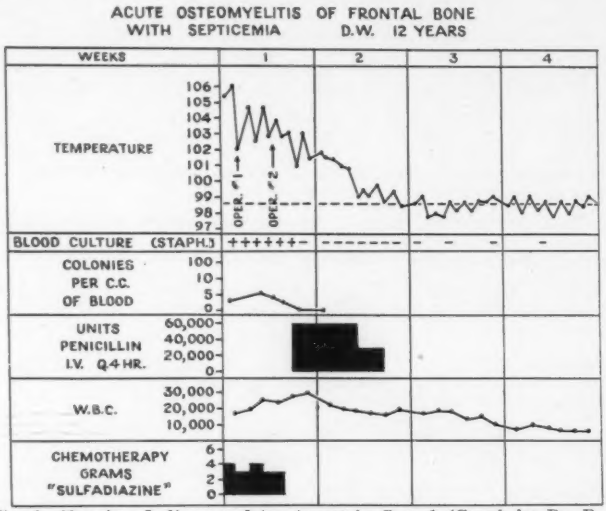

Fig. 1. Showing findings and treatment in Case 1 (Graph by Dr. R. Hilsinger).

and incontinent and remained in that condition for several days. The condition of the left eye caused considerable concern. A cavernous sinus thrombosis or some other intracranial complication was suspected. A staphylococcus bacteremia was present.

The frontal sinuses were first drained externally and later were dealt with radically. The bone of the left anterior plate was found to be softened. Cultures from both sinuses were positive for staphylococcus aureus. Sulfadiazine therapy did not alter the course of the case and penicillin therapy was instituted. Under treatment with unusually large doses (total 340,000 units) of this drug, the patient showed marked im-

provement and made a rapid recovery as demonstrated in Fig. 1.*

Case 2: R. O., a three-and-one-half-year-old, white, male, was admitted to the Children's Hospital, Sept. 17, 1943. Twelve days before, following a fall, the child had developed a hematoma over the forehead. This persisted for eight days, at which time the left eye and the left half of the face became swollen and the patient developed fever, malaise, and anorexia.

On admission (T 104) the skin over the left side of the face was markedly swollen and edematous. The left eyelids were red, swollen and almost completely closed. The conjunctiva and sclera were injected and chemotic. The eyeball was slightly proptosed and the ocular movements were slow and limited. There was profuse serosanguinous foul-smelling discharge from the left nostril. There was considerable swelling over the left hard palate area which was fluctuant to touch. The uvula was swollen and edematous. Pressure on the left upper gums produced exuding pus. The cervical nodes were enlarged, especially on the left side. The remaining physical findings were not remarkable.

Laboratory Examination: Blood—Hg. gm. 9.4; Hb./cell 28.2; R.B.C. 3,300,000; W.B.C. 27,700; P.M.N. 87 per cent; Lymph. 11 per cent; Mono. 2 per cent. Nose and throat cultures were predominantly hemolytic staphylococcus aureus. Blood culture taken on admission developed pure cultures of hemolytic staphylococcus aureus.

Repeated X-ray examinations showed all of the sinuses to be cloudy. The antra in particular were opaque. There was no recognizable osteomyelitis anywhere and no evidence of fracture in the frontal area.

Provisional Diagnoses: *1.* Purulent maxillary sinusitis. *2.* Osteomyelitis of maxillary ridge and hard palate. *3.* Septicemia. *4.* Cellulitis of left orbit and face.

Treatment: Initial treatment consisted of sulfadiazine (grains 25) intramuscularly, and 5 per cent glucose solution intravenously, with hot compresses to left side of the face.

Operation, Sept. 19, 1943: Surgeon, Dr. Sam Seltz. General anesthesia. Through an incision in the left supra-alveolar ridge, an opening was made into the left antrum (no pus seen). A second incision into the left hard palate produced a profuse return of foul pus with rough bone underneath. The loose upper left bicuspid and premolar teeth were extracted with discharge of pus from the sockets. Cultures were taken.

Subsequent Course: The course for the next three days was quite stormy, although the swelling of the face and periorbital region began to subside as drainage continued from the incisions which had been made. On the third day patient developed gross hematuria with no evident drug crystals. He had received about 70 gr. of parenteral sod. sulfadiazine in the preceding thirty hours. This was thought to be the most likely explanation for the bloody urine, although the possibility of septicemia as a basis was also considered. The diazine was discontinued and sulfathiazole given in doses up to 3 gr. per pound. Other treatment consisted of continuous massive hot compresses to the locally involved areas, continuous intravenous fluids, blood transfusions and measures to provide

*One month after this paper was presented and four months after the radical frontal sinus operation, the patient developed a metastatic area of ostemyelitis in the left frontoparietal region. She was readmitted to the hospital and a button of sound bone (3 cm. diameter), including the diseased area, was removed. Cultures taken at the operation showed the presence of hemolytic staphylococcus aureus. Since the patient was afebrile, no medication was administered. At the present time, March 4, 1944, the patient is in excellent condition, and there is no X-ray evidence of any additional area of osteomyelitis in the skull.

adequate drainage from the nose. The blood culture was also reported as positive on the third day. All those taken thereafter were negative.

On the fourth day the patient's condition became critical. His temperature rose to over 105; he became lethargic; his pulse became very rapid; his respiration became difficult (thought to be largely due to mechanical obstruction) and there were some signs suggestive of mild cardiac failure. No additional complications could be found to account for the turn for the worse. He was given oxygen and rapidly digitalized. The next morning he was no better. His temperature rose to 106 and for the first time he had a chill (blood culture negative). That same

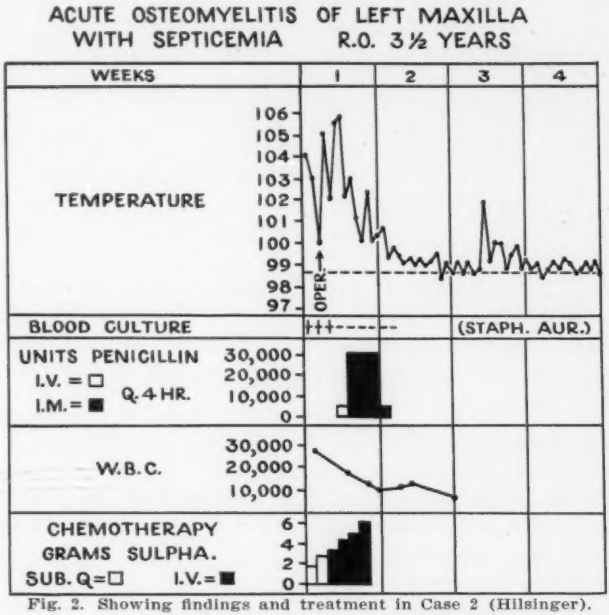

Fig. 2. Showing findings and treatment in Case 2 (Hilsinger).

The two cases herein reported bear a close resemblance to the two severe cases of facial and orbital cellulitis reported by Herrell and his associates (4) (5), but in neither of their cases was there evidence of bone involvement.

afternoon he looked noticeably better and by 8:00 P.M., his temperature had fallen to 102.4. It was at this time that he was started on penicillin, being given 5000 units stat, i.v. and then 5000 units q. 4 h. until he had received a total of 100,000 units. His course from the afternoon of this day (when the penicillin was first administered) was one of steady improvement. (Fig. 2.) He became afebrile within a week and the local swelling and drainage gradually subsided. The uvula sloughed off. X-ray of the involved area taken on four occasions (although they were not very satisfactory) showed evidence of sinusitis, but osteomyelitis could not be visualized.

Discussion: This patient was admitted twelve days after an injury to his forehead. At the time of admission he was suffering from fever and showed marked cellulitis of the left

side of the face and left orbit. There was a profuse purulent discharge from the left nostril and clinical and X-ray evidence of sinusitis. (It is not certain that the accident was the cause of the infection; the two conditions may have been coincidental.) The first three blood cultures showed a staphylococcus bacteremia. At operation, pus and bare bone were found about the left antrum and palate. Sulfonamides were administered from the start, but, nevertheless, the patient's conditions became critical (hyperpyrexia). At this time penicillin therapy was instituted and was followed in a few days by marked improvement in both the local and general condition of the patient. It should be noted that the blood culture immediately preceding the penicillin therapy was negative and it is possible that the sulfa compounds inhibited the growth of the bacteria; nevertheless, it seems much more likely that the penicillin overcame the bacteremia. Although there was no X-ray evidence of osteomyelitis, the findings at operation were quite suggestive of that condition. As is well known, X-ray evidence of osteomyelitis is usually absent in the early stages of that condition, and it seems very likely that the operation together with the penicillin therapy aborted the disease and was responsible for the recovery of the patient (Fig. 2).

Summary: Two cases of osteomyelitis are presented, one involving the frontal bone and the other the superior maxilla. Both cases were complicated by hemolytic staphylococcus bacteremia. In both cases the sulfa compounds were first used ineffectively. Recovery ensued after employing penicillin. Considering the seriousness of osteomyelitis of the skull, the use of this potent agent holds great promise for the future.

Since this paper was presented, my attention has been called to two similar cases reported from the Mayo Clinic by H. L. Williams and D. R. Nichols, "Spreading Osteomyelitis of the Frontal Bone Treated with Penicillin," Proceedings of the Staff meeting of the Mayo Clinic, 18:467, Dec. 1, 1943.

BIBLIOGRAPHY.

1. KEEFER, C. S., et al.: Penicillin in the Treatment of Infections, *J. A. M. A.*, *122*:1217, Aug. 22, 1943.

2. LYONS, MAJOR CHAMP, M.C., U.S.A.: Penicillin Therapy of Surgical Infections in the U. S. Army. *J. A. M. A.*, *123*:1007, Dec. 18, 1943.

3. Personal communication from Dr. C. Keefer.

4. HERREL, W. E.; HEILMAN, D. H., and WILLIAMS, H. L.: The Clinical Use of Penicillin, Proc. Staff Meet., *Mayo Clinic*, 77:609, 1942.

5. HERRELL, W. E.: Further Observations on the Clinical Use of Penicillin, Proc. Staff Meet., *Mayo Clinic*, 78:65, March 10, 1943.

707 Race Street.

SUMMER COURSE IN AUDIOMETRY AND THE FITTING OF HEARING AIDS.

STATE UNIVERSITY OF IOWA.

The State University of Iowa will feature in its 1944 Summer Session, in addition to the regular program of graduate study leading to the M.A. and Ph.D. degrees in speech pathology or hearing conservation, an intensive four-weeks course in Audiometry and the Fitting of Hearing Aids, from June 26 to July 22. This will be a practical course for physicians, physicians' assistants, public health nurses, rehabilitation aides, speech correctionists and hearing conservation specialists in both civilian and military programs. There will be three hours daily of practical laboratory work in the Otologic Clinic of the University Hospital, supplemented by three hours of lectures on the various aspects of hearing conservation, including lip reading and speech training. The course will be under the direction of Dean M. Lierle, M.D., Head of the Department of Oral Surgery and Otolaryngology, and Chairman of the Committee on the Conservation of Hearing. He will be assisted by Scott Reger, Ph.D., and Loraine Anson, M.A. Supplementary instruction will be presented by the Speech Clinic staff, Wendell Johnson, Ph.D., Director; Charles R. Strother, Ph.D; Grant Fairbanks, Ph.D., and Jacqueline Keaster, M.A.

Running concurrently with this intensive course will be a Conference Series on Speech and Hearing Rehabilitation each week-end from June 23 to July 22. The Conferences will be conducted by the following visiting speakers: Bryng Bryngelson, Ph.D., University of Minnesota; Harold Westlake, Ph.D., Pennsylvania State Department of Education; Herbert Koepp-Baker, Ph.D., Pennsylvania State College; Raymond Carhart, Ph.D., Northwestern University; Walter Hughson, M.D., Abington, Pennsylvania Memorial Hospital. These speakers will discuss the various phases of speech and hearing rehabilitation in both its civilian and military aspects.

The Summer Speech Clinic for school children and adults will run from June 19 to July 28.

DR. DEAN.

IN MEMORIAM

LEE WALLACE DEAN, M.D.

The colorful career of a great doctor, teacher and administrator ended when death claimed Dr. Lee Wallace Dean, internationally known otolaryngologist, Feb. 8, 1944, at his home in St. Louis, Mo.

Outstanding for many years in the profession he loved, and to which he made significant contributions, Doctor Dean's loss is felt keenly in many areas, particularly by those former students in all parts of the United States, in whom he instilled his high ideals and unfailing zeal for the welfare of his patients. A strict disciplinarian, with uncompromising standards of excellence, Doctor Dean had the respect of everyone with whom he was associated and was rewarded by the affection and loyalty of those who studied and trained under his direction. Portraits of Doctor Dean hang in Washington University in St. Louis and also in University of Iowa, testimonials to the esteem in which he was held at both institutions.

Doctor Dean was a native Iowan. He was born March 28, 1875, in Muscatine. His parents were Dr. Henry Munson and Emma Johnson Dean. His father and two of his brothers were doctors. Upon completing his public school education in Muscatine, Doctor Dean entered the State University of Iowa. He received his B.S. degree in 1894, and his M.S. and M.D. degrees in 1896. During his period of medical study, he taught chemistry in the University.

His studies were continued in Vienna and London. He traveled widely in Europe, and before returning to the United States, served an internship at the Golden Square Hospital in London. Home again, he taught physiology and anatomy at the State University of Iowa. From 1900 to 1927 he was Professor and Head of the Department of Otolaryngology and Oral Surgery, and from 1912 to 1927 he was also Dean of the College of Medicine. During the World War I he served as commanding officer of General Hospital No. 54,

and in the Medical Officers' Reserve Corps held the rank of lieutenant colonel, retired.

In 1904, Doctor Dean married Ella M. Bailey. Mrs. Dean also is well-known to her husband's associates as his constant and understanding companion, and much of his success has been attributed to her loyal cooperation. In addition to his wife, Doctor Dean is survived by his son, Lee Wallace II, and three grandchildren.

At Iowa, Doctor Dean established one of the largect clinics to be developed in a general hospital in the United States. He worked tirelessly in the interests of the underprivileged and aided in the introduction and enactment of both the Perkins and Haskell-Klaus laws, providing for free medical treatment for indigent children and adults in Iowa.

Passage of this legislation created the need for increased hospital facilities, and Doctor Dean was influential in obtaining a gift to the University of Iowa Hospitals and Medical School from the Rockefeller Foundation. The State appropriated an equal amount, and the new University of Iowa Hospitals and Medical School were built in 1927.

That same year, Doctor Dean accepted the invitation of Washington University in St. Louis to become head of its Department of Otolaryngology. Here another hospital was built, which included McMillan Eye, Ear, Nose and Throat Hospital, and the Oscar Johnson Research Institute. Doctor Dean was Otolaryngologist in Chief at the former institution, and Director of Research at the latter. He also was otolaryngologist at Barnes, Jewish and St. Louis Children's Hospitals.

Hunting and fishing were Doctor Dean's lifelong hobbies. As a boy, in Muscatine, he fished along the Mississippi River, and knew every inch of marshes frequented by mallard and teal. In later years he fished in northern Minnesota and off the coast of Florida. If he were too busy to go far, he hunted jacksnipes, rabbits and squirrels near his home. If time permitted, he was off for the quail shooting in Kentucky, the pheasant season in North and South Dakota, or sought his

private duck lake near Muscatine. He was a member of the Long Key Fishing Club, the Useppa Island Tarpon Club, and a private duck-hunting club near Dexter, Missouri.

His favorite hunting dogs were Llewellyn setters, Rex, Star and Babe, who were treated as members of his family. Doctor Dean also enjoyed making pets of birds and animals about his home. He watched eagerly for the screech owl to make her nest in the oak near his sleeping porch. He befriended the gray squirrel, and put out feed for a covey of quail who came near the house.

Doctor Dean was a member of the following societies: American Medical Association; American College of Surgeons; American Academy of Ophthalmology and Otolaryngology (past president); American Laryngological Association (past president); American Laryngological, Rhinological and Otological Society (past president); American Otological Society (past president); American Broncho-Esophagological Association; American Board of Otolaryngology; La Societe de Laryngologie des Hopitany; Southern Medical Society; Missouri State Medical Society, and St. Louis Medical Society.

One of his most prized awards was the de Roaldes Gold Medal of the American Laryngological Society which he received for individual achievement.

He contributed widely to the medical journals, writing keenly and intelligently upon many subjects in the field of otolaryngology. He was editor of the Annals of Otology, Rhinology and Laryngology, and also wrote the chapter on Ear, Nose and Throat for Apt's Pediatrics.

The medical profession has lost a great leader who served his generation well, but Doctor Dean's influence will continue to live as an inspiration to others.

D. M. L.

IN MEMORIAM

DR. DEAN.

Paragraphs Written in an Intimate Vein.

Dr. Dean had the distinction of holding a high position in two medical schools. First he was head of the Department of Otolaryngology at the University of Iowa, and then, in addition, Dean of the medical faculty; second, he rounded out and finished his career at Washington University, St. Louis, again as head of the Department of Otolaryngology, succeeding Sluder. He had the fortunate ability of interesting people of influence and means in his department. He built up a large, and one of the best-known post-graduate courses in his specialty. Not a few outstanding men in present day Otolaryngology were trained under him. No teacher could ask a greater reward.

He was responsible for the conception and building of the new medical buildings of the University of Iowa on the river bluffs, a location which is unusually fortunate and dramatic. This group of buildings is one of the finest of any medical school in the country. The central tower is most impressive, especially when lighted at night.

As editor of the *Annals of Otology, Rhinology, and Laryngology*, he and his associate Dr. Proetz, made it one of the outstanding journals in Otolaryngology.

He stimulated research. Bunch, Proetz and Hansel made names for themselves for the work they carried out as members of his department. As I recall it, Dr. Dean's own research work dealt chiefly with sinus disease in children, and allergy. He caused a flurry in otology by linking enteritis in infants with mastoiditis. This, however, proved to be more or less of a local happening.

He was a senior member of the American Board of Otolaryngology, and one of its mainstays. His wide reputation

was a valuable asset to the Board. He could always be depended upon for a considered opinion. When he disagreed he defended his opinions ably. When outvoted he never sulked. He did everything assigned to him cheerfully and well. As chairman of the Board, his presence when controversial matters came up, was a great comfort to me.

Early in my association with Dr. Dean I found him broader than his specialty. He was well informed on politics, business affairs, and the problems and activities of the farmer. It was natural that he should be informed on the latter subject because he was a farm landlord on an extensive scale. I always made it a point to get his views, especially on the problems of the farmer about which I have long been confused by the happenings in Washington and articles in the press.

The human side of Dr. Dean came strongly to the surface when talking about his hunting dogs, especially about one old dog who had a glorious past, and was then living on a pension. Not being anything of a sportsman, I am afraid that I never thrilled adequately to his exploits with gun and rod. What did excite my open admiration, however, was the full comradeship between Mrs. Dean and Dr. Dean. They always went together on hunting and fishing trips, and both were experts. Often in Florida she landed the biggest fish. I never knew a married couple whose tastes were more similar, or whose all-'round abilities were so equal.

Life gave much to Dr. Dean, and he gave much to life. The things which he accomplished, and they were many, are not for today alone, but for many tomorrows. H. P. M.

DIRECTORY OF NATIONAL OTOLARYNGOLOGIC SOCIETIES.

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President: Dr. Wesley C. Bowers, 17 E. 61st Street, New York.
Secretary: Dr. Isidore Friesner, 101 E. 73rd Street, New York.
Place: New York. Time: June 5-6, 1944.

AMERICAN LARYNGOLOGICAL ASSOCIATION.

President: Dr. Charles J. Imperatori, 108 E. 38th Street, New York.
Secretary: Dr. Arthur W. Proetz, Beaumont Building St. Louis.
Place: New York. Time: June 7-8, 1944.

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President: Dr. H. Marshall Taylor, 111 W. Adams Street, Jacksonville.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Building, Rochester, N. Y.
Place: New York. Time: June 9-10, 1944.

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Southern—Chairman: Dr. William C. Warren, Jr., Doctors' Building, Atlanta.
Middle—Chairman: Dr. Fred W. Dixon, 2060 East 9th Street, Cleveland.
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Chairman: Dr. Claude C. Cody, 1304 Walker Ave., Houston.
Secretary: Dr. Louis H. Clerf, 1530 Locust Street, Philadelphia.
Place: Chicago. Time: June 12-16, 1944.

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President-Elect: Dr. Gordon B. New, Mayo Foundation, Rochester, Minn.
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President: Dr. Robert L. Moorhead, 125 Ramsen Street, Brooklyn.
Secretary: Dr. Paul Holinger, 700 N. Michigan Avenue, Chicago.
Meeting Place: New York City, Waldorf-Astoria Hotel, June 6, 1944.

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Vice-President: Dr. Kenneth Brandenburg, 707 Security Building, Long Beach, Cal.
Secretary-Treasurer: Dr. Orrie E. Ghrist, 210 N. Central, Glendale, Cal.
Committeewoman: Dr. Etta C. Jeancon, 523 W. 6th Street, San Francisco.
Place: Los Angeles County Medical Association Building, 1935 Wilshire Boulevard, Los Angeles.
Time: 6:00 P.M., fourth Monday of each month, September to May, incl.

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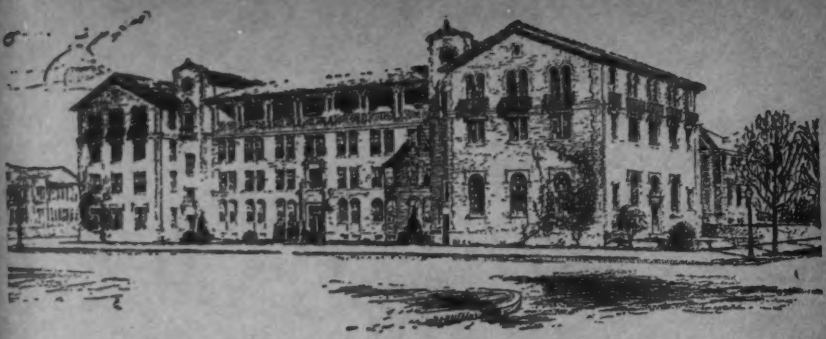
President Dr. Romeo A. Luongo, 2054 Locust Street, Philadelphia.
Secretary: Dr. Jacob Daley, 104 East 40th Street, New York.



Central Institute for the Deaf

NATIONAL RESIDENTIAL AND DAY SCHOOL FOR THE DEAF AND DEFECTIVES IN SPEECH

Approved by Advisory Council of Foremost Ear Specialists and Educators

New fire-proof buildings beautifully located opposite Forest Park. Modern Dormitories and Equipment. Best home environments. Pupils constantly in care of teachers or experienced supervisors.

ORAL SCHOOL FOR DEAF CHILDREN

C. I. D. offers all advantages of exclusively Speech Training and expert medical supervision for both Resident and Day Pupils.
Nursery School (2 years of age) through the Elementary Grades.

ACOUSTIC TRAINING FOR CHILDREN WITH RESIDUAL HEARING

Salvaging of Residual Hearing is a specialty of C. I. D. The Acoustic Method was created here. Group and individual hearing aids used for class instruction at all grade levels.

LIP-READING INSTRUCTION

Private and Class Instruction for Hard-of-Hearing Adults and Children.
Conversational Classes for advanced pupils. Speech conservation stressed.

CORRECTION OF SPEECH DEFECTS

Private and Class Instruction for children with normal hearing and delayed speech or defective speech.
Resident and Day Pupils (2 years of age through Elementary Grades)
Private Instruction for Adults.
Correction of Imperfect Phonation, Imperfect Articulation, Aphasia, Stuttering.

TEACHERS TRAINING COLLEGE

Two years of Training following a professional curriculum for applicants with adequate college qualifications. Graduates qualify for degrees of Bachelor of Science in Education or Master of Science in Education from Washington University. Graduates prepared to teach both the deaf and speech defective.

DR. MAX A. GOLDSTEIN, Founder · MISS JULIA M. CONNERY, Principal Emeritus

For further information address

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